Server LE2200

User's Guide

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Safety Notices

- **Caution:** To reduce the risk of electric shock which could cause personal injury, follow all safety notices. The symbols shown are used in your documentation and on your equipment to indicate safety hazards.

- **Warning:** Lithium batteries can be dangerous. Improper handling of lithium batteries may result in an explosion. Dispose of lithium batteries as required by local ordinance or as normal waste if no local ordinance exists.

- **Warning:** The detachable power supply cord is intended to serve as the disconnect device.

- **Warning:** This equipment has a 3-wire, grounded power cord. To prevent electrical hazards, do not remove or defeat the ground prong on the power cord. Replace the power cord if it gets damaged. Contact your dealer for an exact replacement.

  In the U.S.A. and Canada, the power cord must be a UL-listed detachable power cord (in Canada, CSA-certified), type ST or SJT, 16 AWG, 3-conductor, provided with a molded-on NEMA type 5-15 P plug cap at one end and a molded-on cord connector body at the other end. The cord length must not exceed 9 feet (2.7 meters).

  Outside the U.S.A. and Canada, the plug must be rated for 250 VAC, 10 amp minimum, and must display an international agency approval marking. The cord must be suitable for use in the end-user country. Consult your dealer or the local electrical authorities if you are unsure of the type of power cord to use in your country. The voltage change occurs via a switch in the power supply.

- **Warning:** Under no circumstances should the user attempt to disassemble the power supply. The power supply has no user-replaceable parts. Inside the power supply are hazardous voltages that can cause serious personal injury. A defective power supply must be returned to your dealer.

Safety Notices for Users Outside of the U.S.A. and Canada

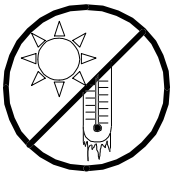
- **PELV (Protected Extra-Low Voltage) Integrity:** To ensure the extra-low voltage integrity of the equipment, connect only equipment with mains-protected electrically-compatible circuits to the external ports.

- **Remote Earths:** To prevent electrical shock, connect all local (individual office) computers and computer support equipment to the same electrical circuit of the building wiring. If you are unsure, check the building wiring to avoid remote earth conditions.

- **Earth Bonding:** For safe operation, only connect the equipment to a building supply that is in accordance with current wiring regulations in your country. In the U.K., those regulations are the IEE.

Care and Handling

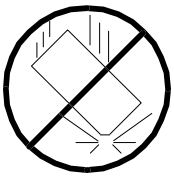
Use the following guidelines to properly handle and care for your system.



Protect the system from extremely low or high temperatures. Let the system warm (or cool) to room temperature before using it.

Keep the system away from magnetic forces.

Keep the system dry. Do not wash the system with a wet cloth or pour fluid into it.



Protect the system from being bumped or dropped.

Check the system for condensation. If condensation exists, allow it to evaporate before powering on the system.

Keep the system away from dust, sand, and dirt.

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Chapter 1

Introduction

Contents

Organization 1
Notational Conventions 3

This guide tells you how to configure and upgrade your server. Its goal is to familiarize you with your server and the tasks necessary for system configuration and upgrading.

Organization

Chapter 1

Introduction—Introduces you to the purpose and structure of this guide.

Chapter 2

Features—Gives you an overview of the server and describes major system components.

Chapter 3

Configuring Your System— Tells you how to configure the system and provides instructions for running the Resource Configuration Utility (RCU), the BIOS Setup Utility and the SCSISelect Utility. Chapter 3 also tells you how to configure system board jumpers to set specific operating parameters.

Chapter 4

Upgrades and Options—Provides you with instructions for upgrading your system with optional memory, options cards, and peripheral devices.

Chapter 5

Problem Solving—Contains helpful information for solving problems that might occur with your system.

Appendix A

System Cabling—Includes cabling information for your system.

Appendix B

Memory Configurations—Defines the allowable memory configurations for your system.

Glossary—Defines the standard acronyms and technical terms used in this manual.

Equipment Log—Provides you with a sample equipment log for documenting the system configuration and updates.

Notational Conventions

The notational conventions listed below are used throughout this manual.

F1

A letter, number, symbol, or word in CAPs represents a key on your keyboard. For example, the instruction press F1 means press the key labeled F1 on your keyboard.

ENTER

The ENTER key is interchangeably used as RETURN and CARRIAGE RETURN.

CTRL + ALT

Two or three key names, separated by plus sign (s), indicate multiple-key entries. For example, CTRL + ALT + DEL means hold down the CTRL and ALT keys and press the DEL key.

The special notices listed below are used throughout this manual to emphasize specific information:

Warning: Warning indicates a hazard that can cause serious personal injury or death if the hazard is not avoided

Caution: Caution indicates a hazard that might cause personal injury

Notice: Notice indicates the potential to damage equipment or data is present if the user does not take the necessary precautions recommended by the Notice.

Note: Notes are used to identify or amplify a point to the reader. A Note may be used to emphasize a recommended sequence of steps.

Chapter 2

Features

Contents

Overview 1
System Chassis 3
System Board Features 4

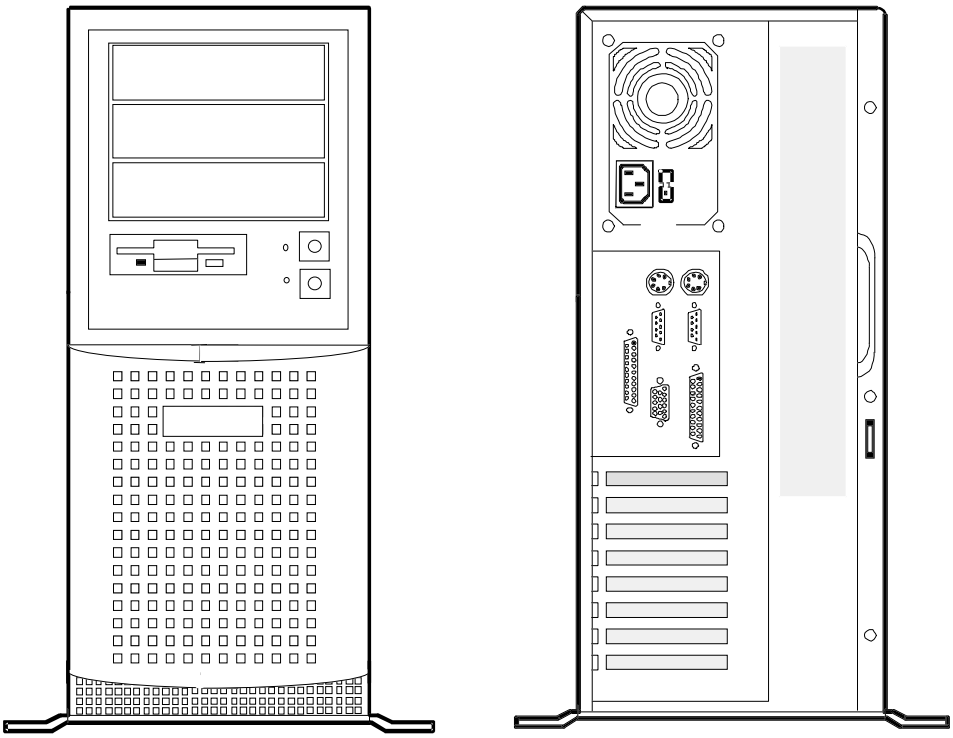
Overview

The system (see Figure 2-1) is a modular, multiprocessing server based on the Intel® Pentium® II chip set. The chassis and system board have been designed to meet the needs of the server marketplace.

The combination of compute performance, memory capacity, and integrated I/O provides a high performance environment for many applications including network servers, multi-user systems, and computer-aided design/computer-aided engineering (CAD/CAE) applications.

As application requirements increase, you can expand your server with additional memory, add-in boards and peripheral devices: tape and hard disk drives.

Figure 2-1. System Front and Rear View



FRONT REAR

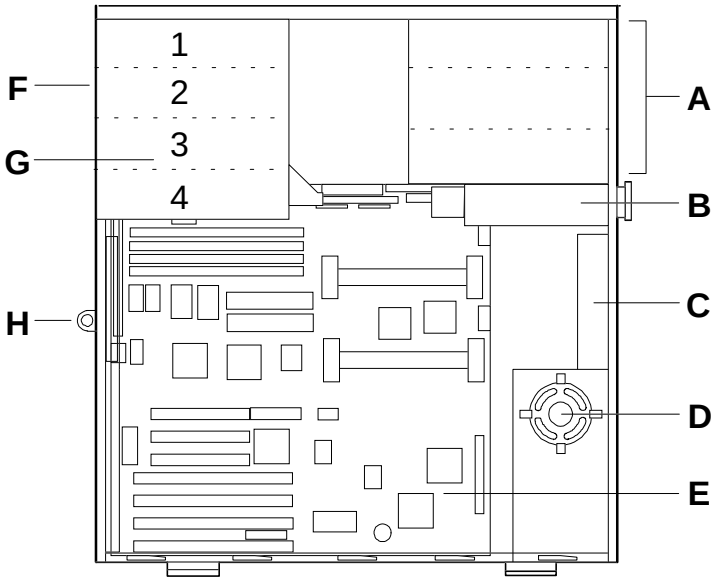
The server features the following major components:

- Up to two Pentium II processors
- A high-performance synchronous system bus to interconnect CPUs and memory subsystems with a bridge to expansion bus I/O.
- On-board IDE controller
- On-board ultra wide SCSI and fast narrow SCSI controllers.
- 6 integrated I/O expansion slots (three ISA, two PCI and one combo).
- Up to 512MB of ECC memory (using 128MB DIMMS). Minimum configuration is 32MB of memory (using a 32MB DIMM).
- Integrated CD-ROM and 1.44MB diskette
- Four hard disk expansion bays
- Three removable media expansion bays.

System Chassis

The system chassis is an easy-to-expand, fabricated metal structure. Figure 2-2 shows the major system components.

Figure 2-2. System Chassis



A. 5.25" front panel peripheral bays
B. 1.44 MB 3.5" diskette drive
C. Fan
D. Speaker
E. System board
F. Power supply (behind 3.5" disk drive bay)
G. 3.5" disk drive bays
H. Security Loop

Each system contains the following major components:

Power Supply

The 300 watt power supply is switch-selectable for 115 or 230 Vac at an operating frequency of 50/60 Hz. It is designed to comply with existing emissions standards and provides sufficient power for a fully loaded system configuration.

Peripheral Bays

The system supports a variety of single-ended standard PC AT-compatible peripheral devices. The chassis includes these peripheral bays:

- A 3.5-inch front panel bay for a 3.5" diskette drive
- 5.25-inch front panel bays for mounting 3 half-height 5.25-inch peripheral devices: diskette drive, tape drive, or CD ROM drive (not a hard disk drive)
- Internal disk drive bays for mounting four SCSI hard disk drives (1" to 1.63" high hard disk drives only).

CD-ROM Drive

The system includes a 5.25" IDE CD-ROM drive installed in the top slot of the front panel bays.

Diskette Drive

The system includes a 3.5" diskette drive installed in a front panel bay. The drive supports 720 KB and 1.44 MB diskette media.

Security Loop

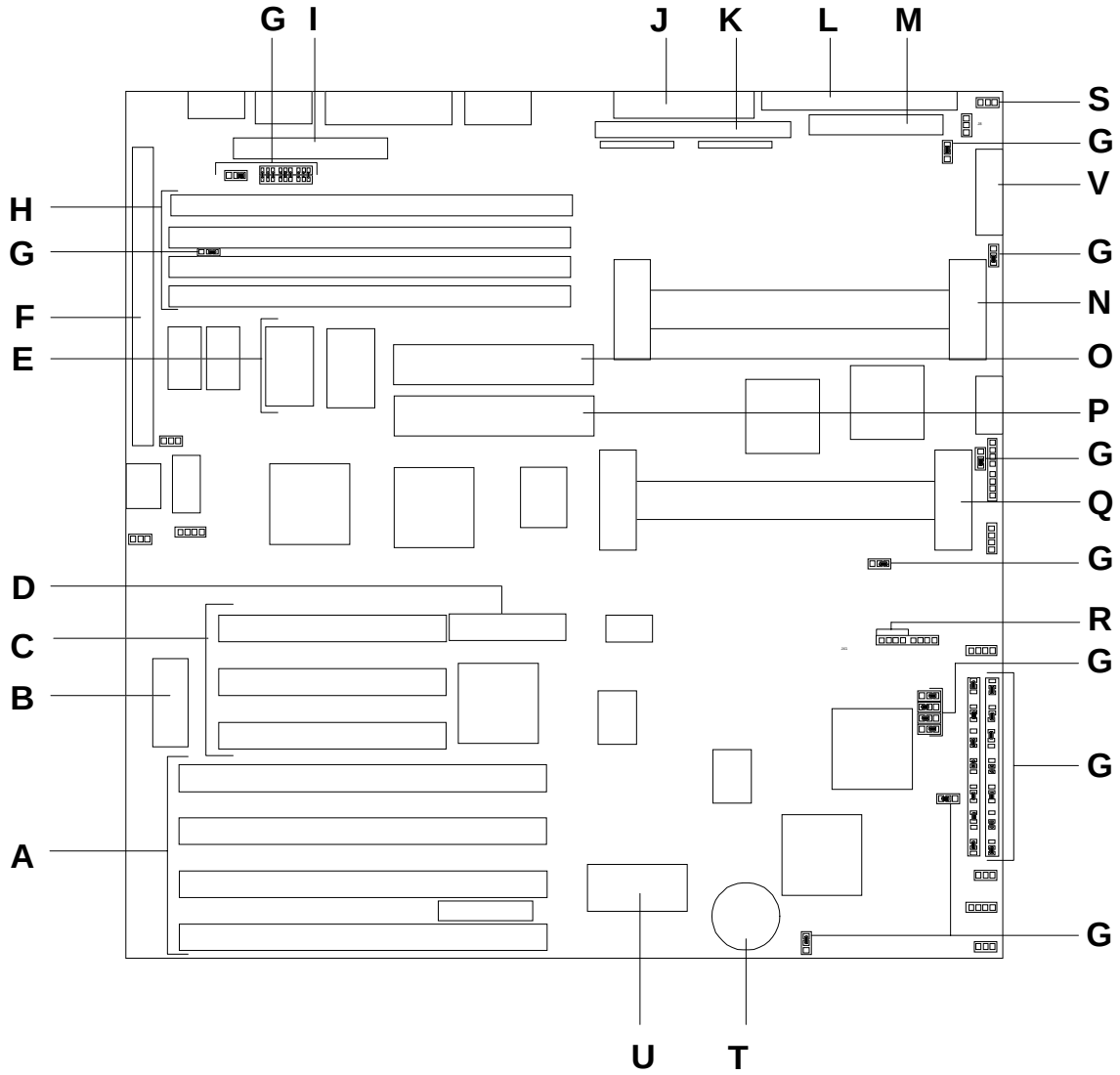
To physically lock the system, insert a padlock (not shipped with the system) through the metal loop on the rear of the chassis.

System Board Features

Each model includes a multiprocessor system board. The system board offers a “flat” design with the processor and memory subsystems residing on the board. Figure 2-3 shows the major components on the system board.

The following subsections describe the system board major components.

Figure 2-3. System Board



A. ISA expansion slots
B. BIOS
C. PCI expansion slots
D. RAID connector (reserved)
E. Optional Video DRAM sockets (2)
F. I/O riser board connector
G. Configuration jumpers
H. DIMM Sockets (4)
I. IDE connector
J. Wide SCSI connector
K. Narrow SCSI connector
L. Front panel connector
M. Diskette connector
N. CPU 2 (optional)
O. Voltage Module 2 (optional)
P. Voltage Module 1
Q. CPU 1
R. Speaker connector
S. Fan connector
T. Real time clock battery
U. Non-volatile memory
V. Reserved

Pentium II Processor

The system can include one or two Pentium II processors mounted on the system board. The board also contains voltage regulators (Figure 2-3, O and P) to power each processor. The primary Pentium II processor plugs into a socket on the this board (Figure 2-3, Q). This processor features a 512 KB cache. ECC generation/checking is provided for detection and correction of cache errors. An optional second Pentium II processor (Figure 2-3, N) enhances performance and enables symmetric multiprocessing (SMP). Both processors access the same memory and I/O space and tasks can run on either CPU if your operating system (OS) supports SMP.

System Memory

The system board contains four 168-pin DIMM sockets (Figure 2-3, H). The minimum system board configuration includes 32 MB of system memory. 4 DIMM sockets allow for system memory expansion to 512 MB. ECC generation/checking is provided for detection and correction of memory errors.

I/O Expansion Slots

The server's expansion capabilities meet the needs of file and application servers for high performance I/O by providing a combination of PCI local bus and ISA connectors. The system board offers two dedicated PCI slots, three dedicated ISA slots, and one shared PCI/ISA slot.

The system board contains four ISA I/O (input/output) expansion slots (Figure 2-3, A). The ISA architecture supports 16-bit memory addressing and 16-bit data transfers.

The system board also contains three PCI bus I/O expansion slots (Figure 2-3, C). The PCI architecture supports 32-bit memory addressing and 32-bit data transfers. One of these slots shares a common chassis I/O expansion slot with one of the ISA slots; if you use this slot as a PCI slot, you cannot use it as an ISA slot.

Real-Time Clock/Calendar

The real-time clock provides system clock/calendar information stored in a non-volatile memory (NVRAM). The real-time clock battery (Figure 2-3, T) provides power backup for the real-time clock.

BIOS

A BIOS (Figure 2-3, B) and Setup Utility are located in the Flash EPROM on the system board and include support for system setup and PCI/ISA Plug-and-Play auto-configuration.

A number of security, reliability, and management features also have been incorporated to meet vital server needs.

IDE Controller

The system includes an IDE interface controller on the system board (Figure 2-3, I) supporting a master and slave device. This provides support for the internally mounted CD-ROM (master device) and an optional slave device (not IDE hard disk drives).

SCSI Controllers

The system includes two onboard SCSI controllers, providing both ultra wide (Figure 2-3, K) and fast narrow (Figure 2-3, J) SCSI support. The fast narrow SCSI controller provides support for internally or externally mounted optional devices. The wide SCSI controller provides support for four internally mounted ultra/wide hard disk drives.

Video Controller

The system has a high-performance SVGA subsystem that supports the following:

- BIOS compatibility with VGA, EGA, CGA, Hercules Graphics, and MDA.
- 1 MB of Video Random Access Memory (VRAM) expandable to 2 MB (Figure 2-3, E).
- 16-bit bus for high-speed display memory access.
- Hardware accelerated bit block transfers (BITBLT).
- Display power management system.
- Supports 72Hz refresh, non-interlaced at: 640x480, 800x600, 1024x768, or 1280x1024 resolutions.
- Displays of up to 16M colors at 640x480 and 800x600 resolutions, 64K colors at 1024x768 resolutions and 256 colors at 1280x1024 resolutions.

Note: SVGA drivers may be required to use the high-performance video modes.

Peripheral Controller

The advanced integrated peripheral controller supports 2 serial ports and one parallel port through the I/O riser board (Figure 2-3, F). The advanced integrated peripheral controller also supports the connection of a diskette drive (Figure 2-3, M).

External Device Connectors

The I/O panel provides connectors for a PS/2 compatible mouse and a keyboard, connectors for VGA monitor, 2 serial port connectors, and a parallel port connector. It also provides a narrow SCSI external connector.

Chapter 3

Configuring Your System

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Configuring Your System

Configuration and setup utilities are used to change your system configuration. You can configure your system, as well as option boards you may add to your system, using the Resource Configuration Utility (RCU) diskette. Also, several unique system parameters are configured using BIOS Setup which is stored in the system FLASH memory. A diskette is not needed to run BIOS Setup.

A Utilities diskette contains the SCSISelect Utility and the Event Log Utility. The Event Log Utility is used to read stored system event information. The SCSISelect Utility is used if you need to configure the SCSI controller in your system or to perform a SCSI disk format or verify disk operation of these drives.

If your system has been factory configured, the RCU, BIOS Setup, or SCSISelect utilities do not need to be run unless you want to change the password or security features, add option boards or devices, or upgrade your system board.

There are some system configuration parameters that are set by jumpers on the system board. However, these parameters do not usually require change.

This chapter provides procedures for running the RCU, BIOS Setup, and the Utilities diskette. Also, a section describing the system board jumper configurations is presented. Several configuration tables are provided in this chapter to record changes you make to the default system configuration.

You use the EXPRESSBUILDER CD-ROM to create the RCU and Utilities diskettes.

Resource Configuration Utility (RCU)

The Resource Configuration Utility is used to configure your system. The RCU can be used to configure the memory subsystem, peripheral device subsystems, and interface adapters. RCU recognizes ISA Plug-and-Play boards and PCI boards and displays their configuration. ISA (non-Plug and Play) adapter boards must be added to the RCU configuration to reserve the resources required by the ISA boards.

After you add options using the RCU, the system automatically configures and initializes them during system initialization at boot up.

The RCU stores the configuration information in the non-volatile memory on your system. When you exit the RCU the configuration information is written to non-volatile memory. The RCU also maintains the Setup configuration, which is stored in the battery-backed memory. This means that when you exit the RCU, the Setup and RCU configuration will agree with each other.

Using the RCU

If you are adding a non-Plug and Play ISA option board, run the RCU before installing the board using procedures found in the *Upgrades and Options* chapter of this guide. If you are upgrading system memory, do so before running the RCU using procedures found in the *Upgrades and Options* chapter of this guide. To use the RCU:

Notice: The system can fail following improper configuration. Always save the current settings before reconfiguring the system.

Note: Because of license restrictions, the RCU diskette, as created by the EXPRESSBUILDER CD-ROM, is not bootable. In order to use this diskette, you must make it bootable.

1. Power on the system.

2. If the diskette drive is disabled, enable it using the BIOS Setup utility, explained later in this chapter. Specify the correct type of diskette drive.

3. Using the EXPRESSBUILDER CD-ROM, create the RCU diskette. Note that the CD-ROM refers to the RCU as the SCU.

   Note: Perform Step 4 of this procedure the first time you use the RCU diskette. This step enables the RCU diskette to be MS-DOS bootable.

4. Insert the RCU diskette into floppy disk drive A. At the C:\ prompt type:

   SYS A:

   Press ENTER. MS-DOS system files are copied onto the diskette. Your RCU diskette is now bootable.

5. Start the RCU by rebooting the system, with the RCU diskette in Drive A. When the RCU banner is displayed, press ENTER and the System Configuration Utility Main Menu shown in Table 3-1 is displayed.

Table 3-1. Resource Configuration Utility Main Menu

MENU OPTIONS	DESCRIPTION
Learn about configuring your computer	Provides basic instructions on resource configuration and using the Help program.
Configure computer	Lists automatically detected boards, and enables manually adding, moving and removing boards. Plug-and-Play boards don't require configuration files. If you ISA boards which require configuration files, use "Add or remove boards" for a menu to enter or change ISA board configurations. (Refer to *ISA Board Configuration* found later in this chapter). INSERT adds a board not detected or has not been installed. DEL removes a selected board. F7 moves a selected board to a different slot.
Set date	Enables viewing and changing the date that the computer uses.
Set time	Enables viewing and changing the time that the computer uses.
Maintain system configuration diskette	Enables viewing and changing Configuration (.CFG) files and System Configuration Information (SCI) files.
Exit from this utility	Exits from the RCU.

6. Select *Learn about configuring your computer* from the RCU Main Menu and press ENTER if you need information on system configuration. Read through the information and press the F10 key when you are done.

7. Using the ↑ and ↓ arrows highlight *Configure Computer* and press ENTER. The Resource Configuration Utility Menu shown in Table 3-2 displays. The keys that are active while viewing a screen, are displayed on the bottom of the screen.

   Note: Press the F1 key at any time for help and additional information on each option. To return from help, press the ESC key.

8. Select Step 1: Important Resource Configuration information and press ENTER to learn more about the Resource Configuration Utility.

9. Select Step 2 to add an ISA board to your system. Refer to "ISA Board Configuration" in this chapter.

Table 3-2. Resource Configuration Utility Menu

MENU OPTIONS	DESCRIPTION
Step 1. Important Resource configuration information.	Provides information on the Resource Configuration program and how it differs from ISA board configuration.
Step 2. Add or remove boards	Lists automatically detected boards, and enables manually adding, moving and removing boards. Plug-and-Play boards don't require configuration files. This list shows all the boards and options that will be installed in your system.
Step 3. View or Edit Details	Enables viewing and changing your system configuration settings including embedded features, functionality, IRQs, and port selections. Perform Step 3 only if you need to change the system default settings.
Step 4. Examine Switches or Print Report	Enables viewing the required switch and jumper settings and allows printing of a configuration report.
Step 5. Save and Exit	Allows you to save your configuration and exits to the operating system. You can also exit without saving.

10. Select Step 3 to view your systems configuration settings. The normal (default) RCU settings are shown in Table 3-3.

RCU Command Line Parameters

There are RCU options that can be enabled by starting the RCU from the command line with the appropriate switch listed below. To enable an option, insert the RCU diskette in drive A and type `A:SD` at the MS-DOS prompt, followed by one of these command line parameters:

H High resolution display. Sets the display mode to 43 lines for an EGA add-in video controller board or to 50 lines for a VGA board. The default is 25 lines for all add-in video controller boards.

M Monochrome display. The display screens are shown using monochrome attributes, even on a color display. The default is to display color, unless a monochrome video display is detected. Use this parameter when you have redirected the console to one of the onboard serial ports.

RCU Configuration Settings

Table 3-3 shows the RCU settings for a sample system and provides a place for you to record any changes you make to the settings. To display the configuration settings, select Step 3 under the Resource Configuration Utility Menu. To edit any of the configuration parameters, use the up and down arrows to highlight the desired configuration parameter and press ENTER. Pressing F6 at this point, allows you to edit any of the parameters resources (IRQs, DMAs, I/O ports or memory).

Table 3-3. RCU Configurations

MAIN MENU	NORMAL SETTING	YOUR CONFIGURATION
System Board		
Mouse Controller	Enabled	
RS - 232 COMM Port 1	PORT 3F8h - 3FFh IRQ 4	
RS - 232 COMM Port 2	PORT 2F8h - 2FFh IRQ 3	
Parallel Port	PORT 378h - 37Fh IRQ 7	
IDE Controller	Enabled	
Floppy Controller	Enabled	
SLOT 1 - PCI Ethernet Controller PCI Function 1	Enabled	
Embedded - PCI SCSI Controller PCI Function 1	Enabled	
Embedded - PCI SCSI Controller PCI Function 1	Enabled	
Embedded - PCI VGA Controller PCI Function 1	Enabled	
Standard VGA Resources	Enabled	

ISA Board Configuration

If you want to add a non-Plug and Play ISA board to your system that is not included in a .cfg file, use the following procedures to define and add the option board. It is necessary to define an ISA board to prevent other boards in the system from using the same IRQ levels, DMA channels, I/O port addresses, or memory addresses, that your ISA board uses.

You must run the RCU and add the ISA board to the configuration before installing the ISA board in the system, otherwise the resources on the ISA board may conflict with a Plug-and-Plug board in the system.

BIOS automatically assigns ISA Plug-and-Plug boards to the next available slot. If the slot displayed in Step 2: "Add or Remove Boards" is not the actual slot, it can be moved by using the F7 function key.

Notice: IRQ levels, DMA channels, I/O port addresses, and memory addresses defined using this procedure should reflect the same settings defined by supplied jumpers and/or configuration documents.

---

1. Insert the RCU diskette into drive A: and power-on the system. The system boots-up using the RCU diskette.

2. The RCU Main Menu shown in Table 3-1 is displayed. At the Startup Menu, enter choice 2, *Configure Computer*.

3. The Resource Configuration Utility Menu shown in Table 3-2 is displayed. Select Step 2 *Add or Remove Boards* and press ENTER.

4. The *Step 2: Add or remove boards* screen is displayed. At this screen select *Add* by pressing INSERT.

5. The *Add* screen is displayed telling you to locate the diskette that contains the .cfg file for the board. Press ENTER at this screen.

6. The *Select a Configuration (CFG) file to add* screen is displayed. At this screen select *Not Listed* by pressing F5.

7. The *Add a board without a .cfg file* screen is displayed. Read through the information and press ENTER. The *Add a board without a .cfg file* screen reappears. When the screen reappears select *Create .cfg file* and press ENTER.

8. The *Create A Board CFG File* screen is displayed. At this screen enter the board description and manufacturer and press ENTER.

9. The *New Board Setup* screen is displayed. Using the scrollable list select the resources used by the new ISA board. Table 3-4 provides a place for you to record the configuration you assign to the board.

10. Press F10 when you are finished selecting the resources used by the new ISA board.

11. The *View Current Settings* screen is displayed. Press ENTER to save the current settings.

12. The *Add confirmation* screen is displayed. Review the manufacturer's comments and press ENTER.

Table 3-4. ISA Board Configurations

ISA BOARD DEFINITIONS	YOUR CONFIGURATION
Board Description:	
Manufacturer:	
Interrupts (Select from scrollable list)	
DMA Channels (Select from scrollable list)	
Port address	
Start	
End	
Memory address	
Start	
Length	
Slot	

13. The *Add* screen is displayed. Select the slot in which you want to install the board and press ENTER.

    Note: If the board you add causes a conflict in the configuration, a Caution message is displayed. Press ENTER at the message. This leads you to the screens that allow you to resolve the conflict.

14. The *Step 2: Add or remove boards* screen is displayed. At this screen select *Done* by pressing F10.

15. The *Steps in configuring your computer* screen is displayed. At this screen select "Step 4: Examine switches or print report" and press ENTER.

16. The *Step 4: Examine switches or print report* screen is displayed. The boards marked with an arrow indicate that the boards in your system may have jumpers and switches that you must physically verify or that a software statement with additional information about the board is provided. Select *Done* by pressing F10.

    Note: If the ISA board you are adding to the configuration does not have switches, jumpers, software statements or connection information, an Information message appears on screen. Press ENTER and proceed to the next step.

17. The *Steps in configuring your computer* screen is displayed. At this screen select "Step 5: Save and exit" and press ENTER.

18. The *Save and exit* screen is displayed. At this screen select "Save the configuration and restart the computer" and press ENTER.

19. The *Reboot* screen is displayed. At this screen press ENTER.

20. Now that you have reserved the system resources, you can install the ISA board.

BIOS Setup Utility

The BIOS Setup Utility, like the RCU, is used to change system configuration parameters. This utility has some unique parameters and many parameters that are also configurable with the RCU. The utility is resident in the system FLASH memory and does not require a diskette or an operating system present to run. However, parameters set with the BIOS Setup Utility that can also be set with the RCU, will be overwritten by the RCU the next time the RCU is run.

Using the BIOS Setup Utility

You access the BIOS Setup utility when you turn on or reboot your system. To run the BIOS Setup Utility, perform the following procedure:

1. Power-on or reboot the system. BIOS displays the following:

   Press <F2> to enter SETUP

2. Press **F2**. The BIOS Setup Utility starts and the Main Menu is displayed. The menu bar at the top of the Main Menu lists the following selections:

Menu	Use
Main	Use this menu for basic system configuration.
Advanced	Use this menu for setting the Advanced Features available on your system.
Security	Use this menu to set User and Supervisor Passwords and the Backup and Virus-Check reminders.
Server	Use this menu for configuring Server Features.
Exit	Exits the current menu.

Use the arrow keys to select a menu or an item on a displayed menu. Press the value keys (listed in the table below) to cycle through the allowable values for the selected field. Use the Exit menu's "Save Values" selection to save the current values on all the menus.

To display a submenu, position the cursor on a selection that has a submenu and press ENTER. Selections with submenus are preceded by an arrow.

Refer to the following table for information on the keys you use with Setup. These keys are also listed at the bottom of the Setup menu.

Key	Function in Setup Menu
F1 or Alt-H	General Help window.
ESC	Exit the current menu.
left or right arrow keys	Select a different menu.
up or down arrow keys	Move cursor up and down. The cursor moves only to the settings that you can change.
TAB or SHIFT-TAB	Cycle cursor up and down.
HOME or END	Move cursor to top or bottom of window.
PAGE UP or PAGE DOWN	Move cursor to next or previous page.
F5 or -	Select the previous value for the field.
F6 or + or SPACE	Select the next value for the field.
F9	Load default configuration values for this menu.
F10	Load previous configuration values for this menu.
ENTER	Execute command or Select ➨ submenu.
ALT-R	Refresh the screen.

BIOS Setup Configuration Settings

Table 3-5 shows the normal settings for the BIOS Setup Utility and provides a place for you to record any changes you make to these settings.

Table 3-5. BIOS Setup Configurations

MENU PARAMETER NAME	NORMAL SETTING OR DISPLAY ONLY	YOUR CONFIGURATION
MAIN MENU		
System Time Enter current time (hour, minutes, seconds on 24 hour clock).	Current Time	
System Date Enter current date.	Current Date	
Language Use +/- to change values; indicates the language used by Setup.	English	
***Diskette A:** Use +/- to change values; indicates the type of diskette drive installed.	1.44MB, 3 1/2”	
***Diskette B:** Use +/- to change values; indicates the type of diskette drive installed.	Not Installed	
****IDE Adapter 0 Master**	CD-ROM	
****IDE Adapter 0 Slave**	None	
Video System	VGA	
Memory Cache Press ENTER for menu.		
Memory Cache	Enabled	
Cache System BIOS Area	Write Protect	
Cache Video BIOS Area	Write Protect	
Cache Base 0 - 512K	Write Back	
Cache Base 512K - 640K	Write Back	
CacheExtended Memory Area	Write Back	
*Cache Memory Regions		
Cache C800-CBFF	Uncached	
Cache CC00-CFFF	Uncached	
Cache D000-D3FF	Uncached	
Cache D400-D7FF	Uncached	
Cache D800-DBFF	Uncached	
Cache DC00-DFFF	Uncached	

* This parameter will be overwritten by the RCU setting.

** BIOS does not display the attached slave (tape) device, only the master (CD-ROM) is reported.

Table 3-5. BIOS Setup Configurations (Continued)

MAIN MENU PARAMETER NAME	NORMAL SETTING OR DISPLAY ONLY	YOUR CONFIGURATION
Memory Shadow Press ENTER for menu.		
System Shadow	Enabled	
Video Shadow	Enabled	
*Regions with Legacy Expansion ROMs		
Boot Sequence Press ENTER for menu.	A: then C:	
Boot Sequence	A: then C:	
SETUP Prompt	Enabled	
POST Errors	Enabled	
Floppy Check	Disabled	
Numlock Press ENTER for menu.	On	
Numlock	On	
Key Click	Disabled	
Key Board auto-repeat rate	30/sec	
Key Board auto-repeat delay	½ sec	
Base Memory:	640 KB	
Extended Memory:	127 MB	
ADVANCED MENU		
Integrated Peripherals Press ENTER for menu.		
***Serial Port 1	3F8, IRQ 4	
***Serial Port 2	2F8, IRQ 3	
*Parallel Port	378, IRQ 7	
Parallel Mode	Bi-directional	
Diskette Controller	Enabled	
IDE Adapter	Enabled	
Mouse	Enabled	
Memory Reconfiguration Press ENTER for menu.		
Memory Reconfiguration	Enabled	

- This parameter will be overwritten by the RCU setting.

Table 3-5. BIOS Setup Configurations (Continued)

MENU PARAMETER NAME	DEFAULT SETTING OR DISPLAY ONLY	YOUR CONFIGURATION
DIMM J20 - Row #1 Status	Normal	
Row #2 Status	None	
DIMM J19 - Row #3 Status	None	
Row #4 Status	None	
DIMM J18 - Row #5 Status	None	
Row #6 Status	None	
DIMM J17 - Row #7 Status	None	
Row #8 Status	None	
Memory Row Errors Clear	Press ENTER	
Memory Configuration Message	Enabled	
Memory Warning POST Error	Enabled	
CPU Reconfiguration Press ENTER for menu.		
CPU Reconfigure	Enabled	
CPU #1 Status	Normal	
CPU #2 Status	None	
Clear CPU Errors	Press ENTER	
CPU Error Pause	Enable	
****SMB Configuration** Press ENTER for menu.		
ITF Monitoring Observation	OptROM - END	
Boot Monitoring	Disabled	
Boot Monitoring timeout period	5	
Advanced Chipset Control Press ENTER for menu.		
DRAM Speed	60ns	
DMA Aliasing	Enabled	
8-bit I/O Recovery	4.5	
16 bit I/O Recovery	4.5	
Use Mutiprocessor Specification	1.4	

** Reserved for future use.

Table 3-5. BIOS Setup Configurations (Continued)

MENU PARAMETER NAME	DEFAULT SETTING OR DISPLAY ONLY	YOUR CONFIGURATION
Plug & Play O/S	No	
Reset Configuration Data	No	
Pentium II BIOS Update	Enabled	
SECURITY MENU		
Supervisor Password is:	Disabled	
User Password is:	Disabled	
***Set Supervisor Password**	Press ENTER.	
Set User Password	Press ENTER.	
****Password on boot**	Disabled	
****Diskette Write**	Normal	
****Diskette access**	Supervisor	
System backup reminder	Disabled	
Execute User ROM	Disabled	
Allow SCSI Select	Enabled	
Power Switch Mask	Unmasked	
SERVER MENU		
Thermal Sensor Press ENTER for menu.		
Thermal Sensor	Enabled	
Upper Limit	55	
Lower Limit	7	
ESM ASIC Interrupt	IRQ 13	
SMI	Enabled	
Event Log Initialization	Disabled	
Clear Event Log	No	
Console Redirect Port	Disabled	

- Enabling supervisor password requires a password for entering SETUP.

** These parameters require prior setting of supervisor password.

Exiting BIOS Setup

To exit Setup, select Exit from the menu bar to display the Exit Setup menu.

The following table describes the options on this menu. Note that ESC does not exit this menu. You must select one of the items from the menu or menu bar to exit this menu.

SELECTION	DESCRIPTION
Save changes and Exit	Stores the selections displayed in the menus in CMOS and exits the Setup program.
Exit without Saving Changes	Exits the program without saving any changes you have made in this session. Previous selections remain in effect.
Get Default Values	Displays default values for all Setup menus. Useful if BIOS detects a problem with the values stored in CMOS.
Load Previous Values	Reverts to previously saved values if the new values have not been saved to CMOS.
Save Changes	Stores the current selections without exiting the Setup program.

Using the Utilities Diskette

The utilities diskette contains the SCSISelect Utility and an Event Log Reader Utility.

Note: Because of license restrictions, the Utilities diskette, as created by the EXPRESSBUILDER CD-ROM, is not bootable. In order to use this diskette, you must make it bootable.

To run the Utilities diskette, perform the following procedure:

Note: Perform Step 2 of this procedure the first time you use the utilities diskette. This step enables the diskette to be MS-DOS bootable.

1. Using the EXPRESSBUILDER CD-ROM, create the Utilities diskette.

2. Insert the Utilities diskette into floppy disk drive A. At the C:\prompt type:

   SYS A:

   Press ENTER. MS-DOS system files are copied onto the diskette. Your Utilities diskette is now bootable.

3. Reboot the system with the Utilities diskette in Drive A.

4. The MS-DOS Startup Menu displays. See Table 3-6.

Table 3-6. MS-DOS Startup Menu

MENU OPTIONS	DESCRIPTION
1. Read the System Event Log.	Executes the Log Display Utility which displays any events stored in the system log area.
2. Execute AIC-78xx SCSISelect Utility.	Loads the SCSISelect Utility and displays the current configurations.
3. Exit to DOS.	Exits Utilities and returns to A: prompt.

Viewing the Event Log

The system Event Log Utility displays information on the events stored in the system log area. The information stored includes the name of the event, the date and time the event occurred and data pertinent to the event. Event data may include POST error codes that reflect hardware errors or software conflicts within the system.

Note: Refer to Chapter 5 *Problem Solving* for definitions on all POST error codes.

To view the Event Log, perform the following procedure:

1. Insert the bootable Utilities diskette into floppy disk drive A.
2. Power-on the system. The system boots up.
3. The MS-DOS Startup Menu displays. See Table 3-6.
4. Select *1. Read the System Event Log* from the MS-DOS Startup Menu.
5. The System Event Log Utility starts. The System Event Log Utility screen is displayed. The following screen choices are available.

SCREEN	DESCRIPTION
File	Saves the Event Log and System information to a file.
ElogInfo	Displays Event Log information such as: date, time, and number of times the log was erased; major and minor revision level; and amount of memory used by the event log.
SystemInfo	Displays system information such as: system model; processor type and speed; ROM, SCSI and video BIOS version; number of ISA and PCI slots; total system memory size; and serial and parallel port configuration.
Event log	Displays the Event Log data.
Clear Event log	Clears the Event Log data.
Help	Description of information in this table.
Exit	Exits the System Event Log Utility.

To select an option from the System Event Log Utility screen, use ← and → to highlight the item and press ENTER.

To exit the menu item, press ESC.

SCSISelect Utility

Your system board includes 2 integrated SCSI host controllers used to manage SCSI devices in your system. The AIC7880 wide SCSI controller provides support for four internally mounted ultra/wide hard disk drives. The AIC7860 narrow SCSI controller provides support for internally mounted optional devices as well as externally connected devices.

The integrated SCSI host controller is configured using the SCSISelect utility. Use the SCSISelec*t* utility to:

- Change the SCSI host adapters default values.
- Check and/or change SCSI device settings for a particular device.
- Change the maximum SCSI bus transfer rate.
- Perform low-level formatting on SCSI disk devices.
- Perform verify operations on SCSI disk devices.

When disabling access to the SCSISelect Utility, the SCSISelect utility should be used in conjunction with the BIOS Setup utility. Changing the BIOS Setup utility “Allow SCSI Select” parameter to Disabled prevents the use of the SCSI Select utility via Ctrl-A, but the “Press <Ctrl-A> for SCSI Select” prompt is still displayed. Changing the SCSISelect utility “Display <Ctrl-A> Message During BIOS Initialization” parameter to Disabled prevents the prompt from being displayed. In combination these parameters can be used to prevent access to the SCSISelect utility during boot.

Using the SCSISelect Utility

To run the SCSISelect Utility, perform the following procedure:

1. Insert the bootable Utilities diskette into floppy disk drive A.
2. Power-on the system. The system boots up.
3. The MS-DOS Startup Menu displays. See Table 3-6.
4. Select *2. Execute AIC-78xx SCSISelect Utility* from the MS-DOS Startup Menu. The SCSISelect Utility starts. When SCSISelect detects more than one AIC-78xx host adaptors, it displays a selection menu listing the bus and device number of each adapter. When the selection menu appears, select the channel you wish to configure as follows:

Bus : Device	Selected SCSI Adapter
00 : 08h	AIC7880
00 : 0Bh	AIC7860

3. Once you select the adapter, the following screen is displayed:

SCREEN	DESCRIPTION
Configure/View Host Adapter Settings	Configure host adapter and device settings.
SCSI Disk Utilities	The utility scans the SCSI bus for SCSI devices, reports a description of each device. Run these utilities *before* configuring SCSI devices.

4. If you wish to format a disk, verify disk media, or display a list of devices and their SCSI Ids, select “SCSI Disk Utilities”. If you wish to configure the adapter or a device, select “Configure/View Host Adapter Settings”.

SCSISelect Configuration Settings

The following keys are active for all SCSISelect screens:

KEY	ACTION
Arrows	Up and down arrows move from one parameter to another within a screen.
ENTER	Displays options for a configurable parameter. Selects an option.
ESC	Moves back to previous screen or parameter or EXIT if at the Main menu.
F5	Switches between color and monochrome.
F6	Resets to host adapter defaults.

Table 3-7 shows the normal settings for the SCSISelect Utility and provides a place for you to record any changes you make to these settings.

Table 3-7. SCSISelect Setup Configurations

OPTION	RECOMMENDED SETTING OR DISPLAY ONLY	YOUR CONFIGURATION
SCSI Bus Interface Definitions		
Host Adapter SCSI ID	7	
SCSI Parity Checking	Enabled	
Host Adapter SCSI Termination	Enabled	
Additional Options		
Boot Device Options	Press ENTER for menu	
Boot Target ID	0	
Boot LUN Number	0	
SCSI Device Configuration	Press ENTER for menu	
Initiate Sync Negotiation	Yes	
Maximum Sync Transfer Rate	40.0 [4]	
Enable Disconnection	Yes	
Initiate Wide Negotiation	Yes	
Send Start Unit Command	Yes [1]	
BIOS Multiple LUN Support	no [1]	
Include in BIOS Scan	Yes [1]	
Advanced Configuration Options	Press ENTER for menu.	
Reset SCSI Bus at IC Initialization	Enabled	

[1] No effect if BIOS is disabled.
[4] Set to 40.0 for AIC7880 or 10.0 for AIC7860.

Table 3-7. SCSISelect Setup Configurations (Continued)

OPTION	RECOMMENDED SETTING OR DISPLAY ONLY	YOUR CONFIGURATION
Extended BIOS Translation for DOS Drives >1 GByte	Enabled	
Host Adapter BIOS (Configuration Utility Reserves BIOS Space)	Enabled[1]	
Support Removable Disks Under BIOS as Fixed Disks [1, 2]	Boot Only[1]	
Display <Ctrl-A> Messages During BIOS Initialization	Enabled[1]	
BIOS Support for Bootable CD-ROM	Disabled[1]	
BIOS Support for Int13 Extensions	Enabled[1]	

[1] No effect if BIOS is disabled.
[2] Do not remove media from a removable media drive if it is under BIOS control.
[3] Set to Disable if NetWare 3.12 or 4.11 Network Operating System is installed.

Exiting SCSISelect

To exit SCSISelect, press ESC until a message prompts you to exit (if you changed any settings, you are prompted to save the changes before you exit).

Configuring the Optional RAID Controller

One of the options available for your system is the single channel DAC960 Redundant Array of Inexpensive Devices (RAID) Controller board, which gives your system the added security of fault tolerance.

If you order a system with the RAID controller, the system is pre-configured at the factory. Use Table 3-8 to determine how the RAID controller was configured at the factory. If you want to change the RAID level or add additional hard disks to the array, you must use the DACCF utility.

If you are adding the RAID controller to an existing system, the DACCF utility allows you to configure your disk array before installing your network operating system.

Table 3-8. RAID Configurations

Number of Hard Drives	RAID Level Configured	Hard Drives in Array	Description
1	JBOD	1	**JBOD (Mylex RAID 7)** JBOD is an acronym for Just a Bunch Of Disks. Each drive can operate independently as with a common host bus adapter; or multiple drives may be spanned and seen as a single very large drive. No redundancy is provided.
2	1	2	**Mirroring (RAID 1)** Drives are paired and mirrored. All data is 100% duplicated on an equivalent drive (fully redundant).
3	5	3	**Striping with Parity (RAID 5)** Data is striped across several physical drives. Parity protection is used for data redundancy.
4 or more	5	4 (one standby drive)	**Striping with Parity (RAID 5) with a standby drive** The array consists of three ON-LINE drives and one STANDBY drive. The standby replacement drive, or hot spare, is one of the most important features RAID provides to achieve automatic, non-stop service with a high degree of fault-tolerance.

The DACCF utility is included with the RAID controller. The DAC960 RAID controller supports various versions of RAID technology (referred to as RAID levels). To use any RAID level, you must configure the RAID controller using the DACCF configuration utility prior to installing your Network Operating System. For an explanation of this utility, refer to the *DACCF Utilities Installation Guide and User Manual* that was shipped with the server. Chapter 2 of the manual (*Configuration Strategies)* describes RAID technology and provides tips on making your array perform well in your specific application. Chapter 3 (*Preparing the Array)* covers array hardware preparation, configuration, and initialization. After completing the steps in chapter 3, you can install your Network Operating System.

If you want to be able to remotely (from a PC client) configure the array; increase array capacity online; or monitor statistics on disk and controller activity, you must install the Global Array Manager (GAM) option that was provided with your RAID subsystem. The GAM option includes diskettes and user documentation. Use of GAM is documented in the *Global Array Manager 2 Server Installation Guide*. Increasing array capacity is covered in the *MORE User Guide*. This user guide covers enhancements to both the Global Array manager and DACCF utilities software that implement online RAID expansion (MORE) technology.

Configuring System Board Jumpers

Before You Begin

Only a qualified technical person should perform the procedures in this section.

Notice: Electrostatic discharge (ESD) can damage the system board. Modify the system board only at an ESD workstation. Otherwise, wear an antistatic wrist strap attached to chassis ground.

The system board jumpers enable you to set specific operating parameters for your system. A jumper is a small plastic-encased conductor (shorting plug) that slips over two jumper pins.

Figure 3-1 shows the location of the system board jumpers. Table 3-9 lists the system board jumpers and their factory default settings.

Figure 3-1 . System Board Jumpers

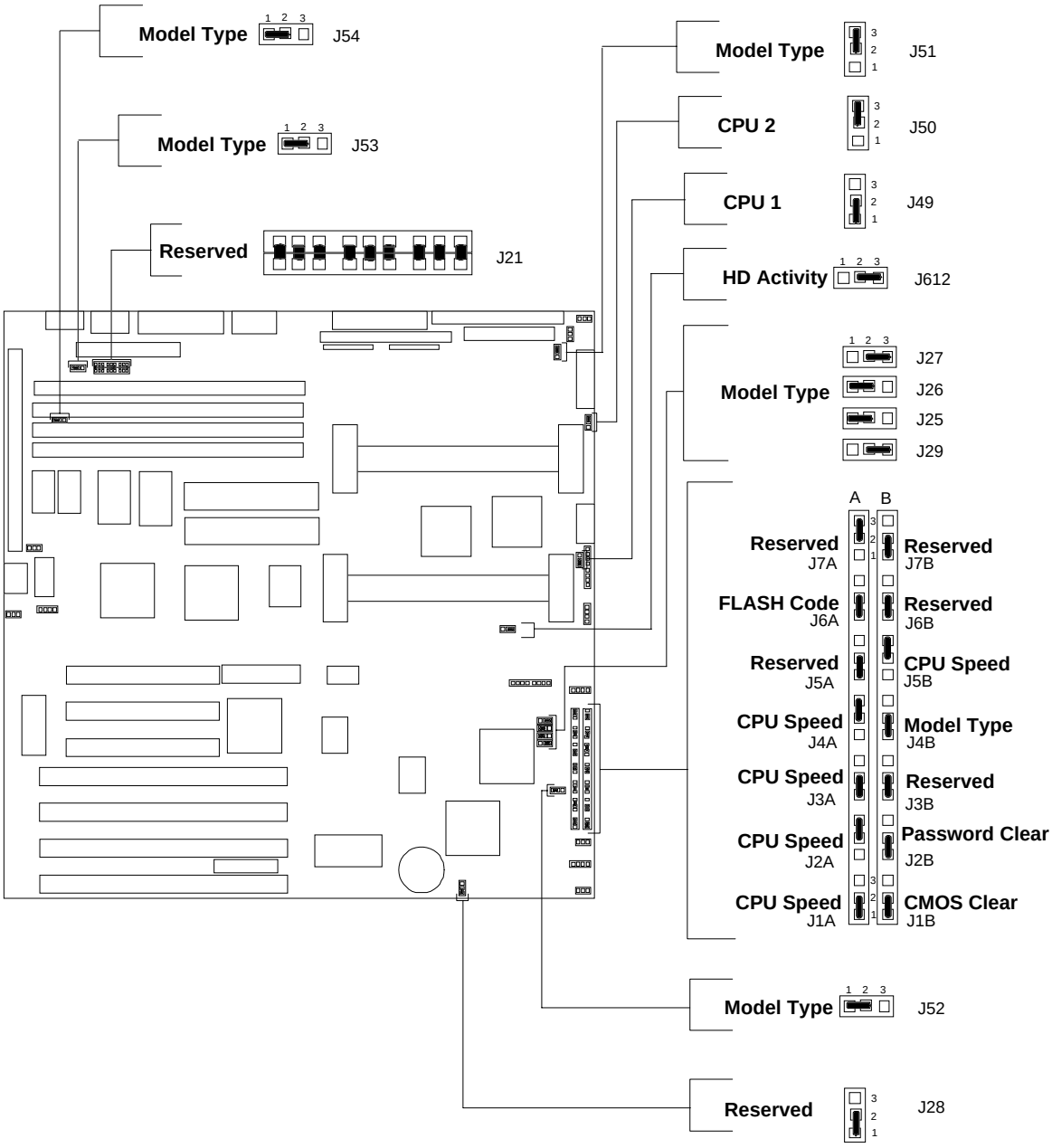

Table 3-9. System Board Jumper Configurations

Jumper	Description	Option	Setting	Factory Default	Your Setting
Reserved **J7A**		Required on factory default.	2-3	2-3	2-3
FLASH Code **J6A**	FLASH reprogramming power protection	BIOS not write protected; FLASH update BIOS write protected; no FLASH update	1-2 2-3	1-2	
Reserved **J5A**		Required on factory default.	1-2	1-2	1-2
CPU Speed **J4A**	Used with jumpers at J1A, J2A, J3A, J5B and J5B to set CPU speed	Refer to Table 3-10 to set CPU speed. Bus:CP Freq = 1:4 = pins 1-2; Bus:CP Freq = 1:2, 1:3, 2:5 or 2:7 = pins 2-3	Dependent on speed of installed CPU.		
CPU Speed **J3A**	Used with jumpers at J1A, J2A, J4A, J5B and J5B to set CPU speed	Refer to Table 3-10 to set CPU speed. Bus:CP Freq = 1:3 or 2:7 = pins 1-2; Bus:CP Freq = 1:2, 1:4 or 2:5 = pins 2-3	Dependent on speed of installed CPU.		
CPU Speed **J2A**	Used with jumpers at J1A, J3A, J4A, J5B and J5B to set CPU speed	Refer to Table 3-10 to set CPU speed. Bus:CP Freq = 1:2, 1:3, 1:4, 2:5 or 2:7 = pins 2-3	Dependent on speed of installed CPU.		
CPU Speed **J1A**	Used with jumpers at J2A, J3A, J4A, J5B and J5B to set CPU speed	Refer to Table 3-10 to set CPU speed. Bus:CP Freq = 2:5 or 2:7 = pins 1-2; Bus:CP Freq = 1:2, 1:3 or 1:4 = pins 2-3	Dependent on speed of installed CPU.		
Reserved **J7B**		Required on factory default.	1-2	1-2	1-2
Reserved **J6B**		Required on factory default.	1-2	1-2	1-2
CPU Speed **J5B**	Used with jumpers at J1A, J2A, J3A and J4A to set CPU speed	Refer to Table 3-10 to set CPU speed. Bus Freq = 60 MHZ = pins 1-2; Bus Freq = 66 MHZ = pins 2-3	Dependent on speed of installed CPU.		
Model Type **J4B**	Used with jumpers at J25, J26, J27, J29, J51, J52, J53 and J54 to set server model type	Required on factory default.	1-2	1-2	1-2
Reserved **J3B**		Required on factory default.	1-2	1-2	1-2
Password Clear **J2B**	Password protection	Password protection enabled Password cleared; protection off	1-2 2-3	1-2	
CMOS Clear **J1B**	Real-time clock CMOS protection	RTC CMOS protection enabled RTC CMOS cleared to factory defaults	1-2 2-3	1-2	
Reserved **J21**	All nine jumpers must be in	Required on factory default.	IN	IN	IN
Model Type **J25**	Used with jumpers at J4B, J26, J27, J29, J51, J52, J53 and J54 to set server model type	Required on factory default.	1-2	1-2	1-2

Table 3-9. System Board Jumper Configurations (continued)

Jumper	Description	Option	Setting	Factory Default	Your Setting
Model Type **J26**	Used with jumpers at J4B, J25, J27, J29, J51, J52, J53 and J54 to set server model type	Required on factory default.	1-2	1-2	1-2
Model Type **J27**	Used with jumpers at J4B, J25, J26, J29, J51, J52, J53 and J54 to set server model type	Required on factory default.	2-3	2-3	2-3
Reserved **J28**		Required on factory default.	1-2	1-2	1-2
Model Type **J29**	Used with jumpers at J4B, J25, J26, J27, J51, J52, J53 and J54 to set server model type	Required on factory default.	2-3	2-3	2-3
CPU 1 **J49**	CPU 0 installed	CPU installed CPU NOT installed	1-2 2-3	1-2	1-2
CPU 2 **J50**	CPU 1 installed	CPU installed CPU NOT installed	1-2 2-3	2-3	
Model Type **J51**	Used with jumpers at J4B, J25, J26, J27, J29, J52, J53 and J54 to set server model type	Required on factory default.	2-3	2-3	2-3
Model Type **J52**	Used with jumpers at J4B, J25, J26, J27, J29, J51, J53 and J54 to set server model type	Required on factory default.	1-2	1-2	1-2
Model Type **J53**	Used with jumpers at J4B, J25, J26, J27, J29, J51, J52 and J54 to set server model type	Required on factory default.	1-2	1-2	1-2
Model Type **J54**	Used with jumpers at J4B, J25, J26, J27, J29, J51, J52 and J53 to set server model type	Required on factory default.	1-2	1-2	1-2
HD Activity **J612**	Used to “OR” the two HD activity signals	“OR” the two HD activity signals Separate HD activity signals	1-2 2-3	2-3	

Table 3-10. CPU Speed Jumper Configurations

CPU SPEED	Jumper Settings				
	J1A	J2A	J3A	J4A	J5B
233/66 MHz	1-2	2-3	1-2	2-3	2-3
266/66 MHz	2-3	2-3	2-3	1-2	2-3
300/66 MHz	1-2	2-3	2-3	1-2	2-3

Moving System Board Jumpers

Caution: Before doing the procedures in this section, make sure that your system is powered off and unplug the AC power cord from the back of the chassis. Failure to disconnect power before moving the jumpers can result in personal injury and equipment damage

Notice: Observe static precautions. Use an antistatic wrist strap.

To configure the system board options:

1. Power off the system and remove the covers as described in Chapter 4 of this guide.
2. Check to ensure the system power cord is removed from the back of the system.
3. Locate the position of the jumpers on the system board you are changing. Refer to Figure 3-1.
4. To change a jumper setting, use a pair of needle-nose pliers or your fingers to remove the jumper from its current location. Position the jumper over the two pins for the desired setting and press it onto the pins. Be careful not to bend the pins. Refer to Table 3-9 for system board jumper settings.
5. Record changes to the system board jumpers in Table 3-9.
6. Install the system covers and power up the system using procedures in chapter 4 of this guide.
7. Run the RCU utility to verify your reconfiguration of the system board.

Updating the BIOS

To update the system BIOS:

Note: This procedure clears the event log contents. If you want to save the event log contents, run the Event Log Reader Utility.

1. Using the EXPRESSBUILDER CD-ROM, create the BIOS FLASH diskette.

2. Insert a bootable DOS diskette into Drive A and power up the system.

3. Insert the BIOS FLASH diskette into Drive A.

4. Enter PHLASH and press ENTER.

5. After the system reboots, load the default values by pressing F2 to enter setup. At the Exit Menu, select *GET DEFAULT VALUES*.

6. Clear the event log by selecting *CLEAR EVENT LOG* at the Server Menu. Press space bar to change NO to YES and press ESC. Select *SAVE CHANGES & EXIT* and press ENTER to continue. The system will reboot.

If the procedure fails, perform the following steps and then retry the Update BIOS procedure.

1. Turn off the system and remove the panels as described in the *Upgrades and Options* chapter.

2. Ensure the FLASH Code jumper J6A is set to pins 1-2 to enable updates to the BIOS (see Figure 3-1).

3. Replace the panel and power up the system with the BIOS FLASH diskette inserted in Drive A

Resetting the CMOS NVRAM

To reset the CMOS NVRAM:

1. Power off the system and remove the panels as described in chapter 4 of this guide.
2. Move the CMOS Clear jumper J1B to pins 2-3 (see Figure 3-1).
3. Turn the system on and wait for the POST to complete. This will automatically reprogram the CMOS NVRAM to the default settings.
4. Power off the system.
5. Move the CMOS Clear jumper to from pins 2-3 to pins 1-2.
6. Replace the panels and power on the system.
7. Run the Setup Utility to configure your system.

Clearing and Changing the Password

To clear and change the password:

1. Power off the system and remove the panels as described in the Upgrades and Options chapter.
2. Move the Password Clear jumper J2B to pins 2-3 (see Figure 3-1).
3. Power on the system and wait for POST to complete. This automatically clears the old password.
4. Power off the system.
5. Move the Password Clear jumper back to pins 1- 2.
6. Replace the panels and power on the system.
7. To specify a new password run the Setup Utility as described earlier in this chapter.

Chapter 4

Upgrades and Options

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Caution: Before doing the procedures in this chapter, make sure that your system is powered off and unplug the AC power cord from the back of the chassis. Failure to disconnect power before opening your system can result in personal injury and equipment damage

Notice: Operating your system with the side panel removed can damage your system components. For proper cooling and airflow, always replace the side panel before powering on your system.

Contact your sales representative or dealer for a list of approved optional peripheral devices.

Static Precautions

An electrostatic discharge (ESD) can damage disk drives, option boards, and other components. You can provide some ESD protection by wearing an antistatic wrist strap attach to chassis ground when handling system components.

Electronic devices can be easily damaged by static electricity. To prevent damage, keep them in their protective packaging when they are not installed in your system.

Preparing Your System for Upgrade

Have the following tools available:

- Phillips screwdriver (#1 bit and #2 bit)
- Flat-head screwdriver
- Small needle nose pliers
- Pen or pencil
- Utility knife
- ESD workstation or antistatic wrist strap (recommended)
- IC removal tool.

Equipment Log

Use the equipment log form located at the end of this manual to record the model and serial number of your system, all installed options, and any other pertinent information specific to your system. You will need this information when configuring your system.

Removing the Side Panel

To install options in your system, you must remove the external side panel.

Notice: For proper cooling and airflow, do not operate the system with the side panel removed. Always replace the panel before powering on the system.

Caution: If you are removing the side panel after the system is set up, you must first power off the system and all external devices. **Unplug** the system power cord

To remove the side panel:

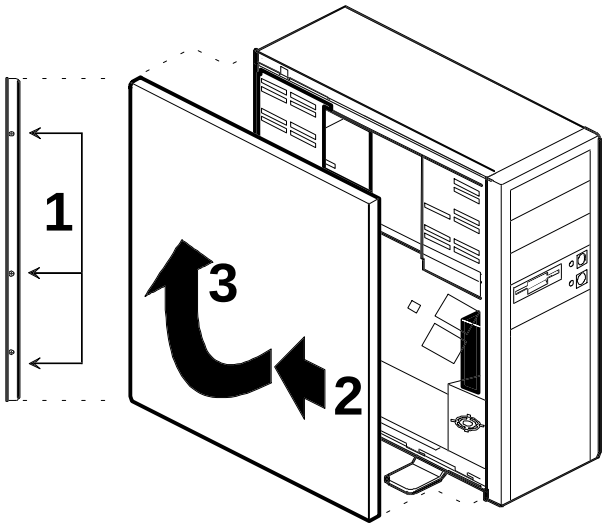
1. Power off the system and ensure it is disconnected from the ac wall outlet.

2. The side panel on the left side of the system (as viewed from the front) is secured with three screws. Remove the padlock (if used) and the screws (Figure 4-1, 1) securing the side panel. Save the screws for reattaching the side panel.

3. Put one hand on the protruding handle on the back of the panel and the other hand under the panel. Slide the side panel toward the rear of the chassis.

4. Pull the side panel up and away from the chassis.

Figure 4-1. Removing the System Side Panel



Installing the Side Panel

1. Before replacing the side panel, make sure no tools or loose parts have been left inside the system chassis.

2. Make sure all option boards are firmly seated in their respective slots and that all interior cables are properly connected.

3. Insert the metal tabs on the top and bottom of the side panel into their slots on the chassis. Slide the side panel forward as far as it will go.

4. Replace the three side panel retaining screws (Figure 4-1, 1) and install the padlock, if used.

Note: If your system is already set up, plug the system back in, reconnect the peripherals, and power on the peripherals and system.

Modifying the System Board

The following sections provide procedures for upgrading and configuring the system board in your system. Topics covered include:

- Installing video memory DRAMs
- Replacing the Non-Volatile Memory
- Replacing the real-time clock battery
- Installing or removing a processor
- Installing or removing DIMMs.

Notice: Electrostatic discharge (ESD) can damage add-in boards and other components; place them on an antistatic surface. Modify the system board only at an ESD workstation. Otherwise, wear an antistatic wrist strap attached to chassis ground.

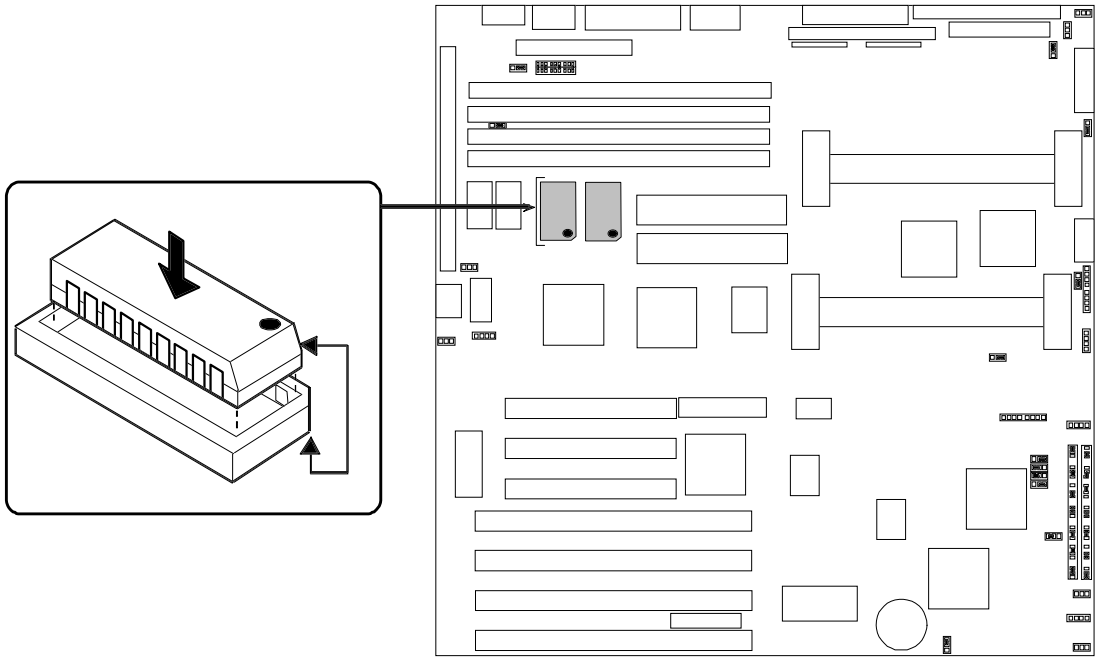
Installing Video Memory

The base system includes two 512K video memory DRAM chips and two sockets on the system board. If you add two additional 512K video memory DRAMs into the sockets shown in Figure 4-2, the base video memory size is increased from 1 MB to 2 MB.

Notice: Observe static precautions. Use an antistatic wrist strap.

1. Power off the system and remove the side panel as described earlier in this chapter.
2. Align the beveled edge of the DRAMs with the notched corner of the DRAM sockets. Refer to Figure 4-2 for the DRAM socket locations.
3. Press the DRAMs down firmly until they are fully seated in their sockets.
4. Replace the side panel and power on the system.

Figure 4-2. Video Memory DRAM Location



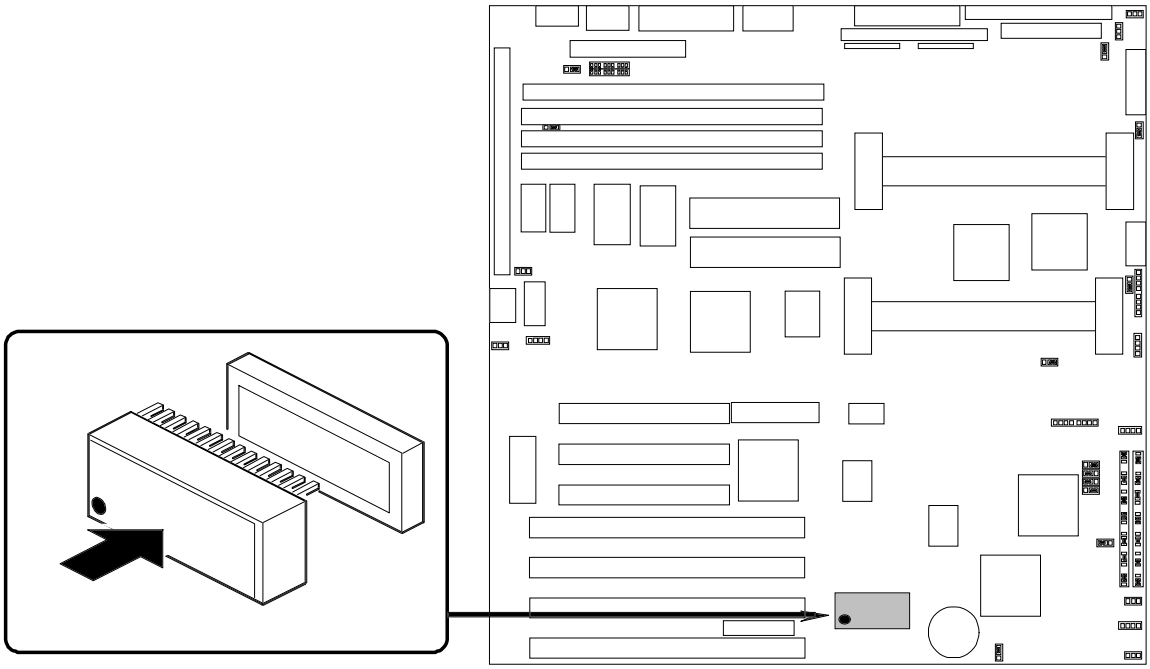
Replacing the Non-Volatile Memory

You may need to replace the non-volatile memory because of its internal integral lithium battery life span. Contact your sales representative or dealer for a list of approved devices. Its located on your system board as shown in Figure 4-3. Notice the dot on the chip. This dot will assist you in correctly positioning the chip on the system board.

Caution: Danger of explosion if battery is incorrectly replaced. Replace only with same or equivalent type recommended by manufacturer. Dispose of lithium batteries as required by local ordinance or as normal waste if no local ordinance exists. Do not expose the component to excessive heat or fire. Keep all batteries away from children

Notice: Observe static precautions. Use an antistatic wrist strap.

Figure 4-3. Non-Volatile Memory Location



1. Power off the system and remove the side panel as described earlier in this chapter.

2. Using a IC removal tool or a small pointed tool, gently pry up each end of the non-volatile memory and pull it straight up out of its socket (Figure 4-3).

3. Orient the new chip over its socket so the dot is properly oriented. Carefully insert the chip into its socket connectors.

4. Press down on the chip until it is firmly seated in its socket.

5. Replace the side panel and turn on the system.

6. Run the BIOS SETUP and RCU to restore proper configuration settings.

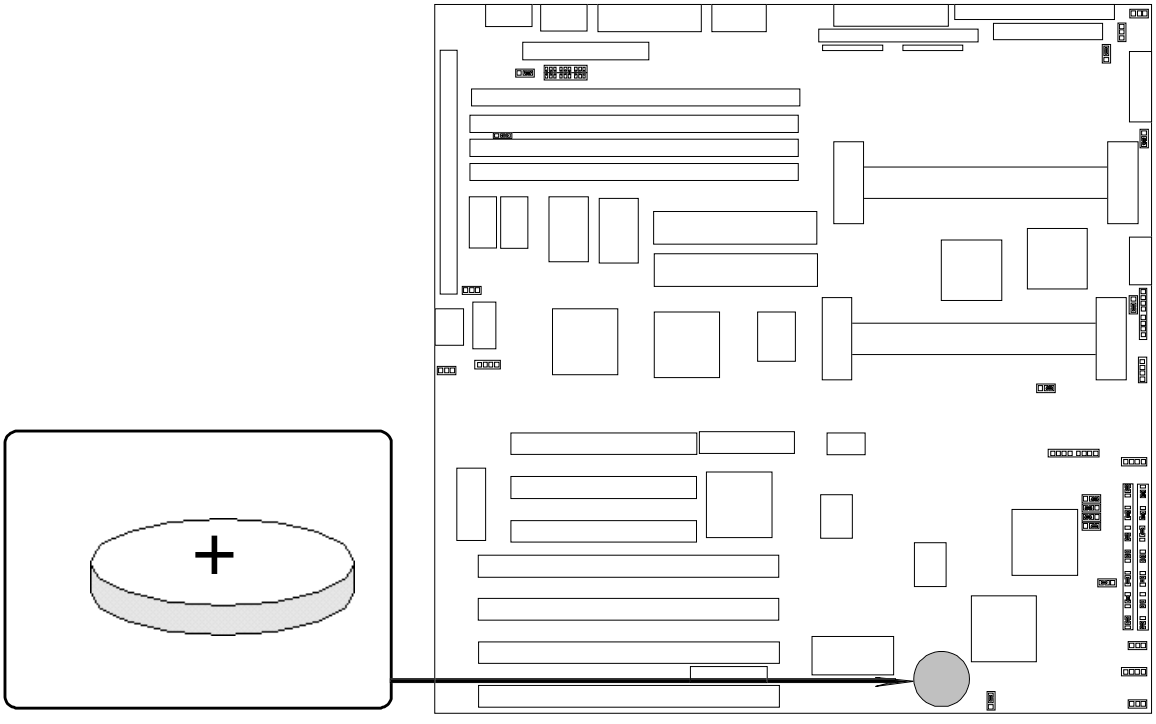
Replacing the Real-time Clock Battery

You may need to replace the real-time clock battery because of its life span. The battery (Vendor Part #CR2450) is a commodity part available through many vendors. Its located on your system board as shown in Figure 4-4. Notice the plus (+)sign on the battery. This sign will assist you in correctly positioning the battery on the system board.

Caution: Danger of explosion if battery is incorrectly replaced. Replace only with same or equivalent type recommended by manufacturer. Dispose of lithium batteries as required by local ordinance or as normal waste if no local ordinance exists. Do not expose the component to excessive heat or fire. Keep all batteries away from children

Notice: Observe static precautions. Use an antistatic wrist strap.

Figure 4-4. Real-Time Clock Location



1. Power off the system and remove the side panel as described earlier in this chapter.

2. Using your finger nail or a small pointed tool, gently push down the top of the battery and pry up the battery out of its socket. Refer to Figure 4-4 for the socket location.

3. Orient the new battery over its socket so the plus (+) sign on the battery is facing up.

4. Carefully insert the bottom of the battery into the socket connectors and gently push the battery into the socket.

5. Press down on the battery until it is firmly seated in its socket.

6. Replace the side panel and turn on the system.

7. Run the RCU to restore configuration settings to the real-time clock.

Pentium II Processor

The following subsections provide procedures for upgrading and configuring the processor in your system. Topics covered include:

- Adding a Pentium II processor
- Removing a Pentium II processor.

Notice: Electrostatic discharge (ESD) can damage components; place them on an antistatic surface. Modify the system board using an antistatic wrist strap attached to chassis ground.

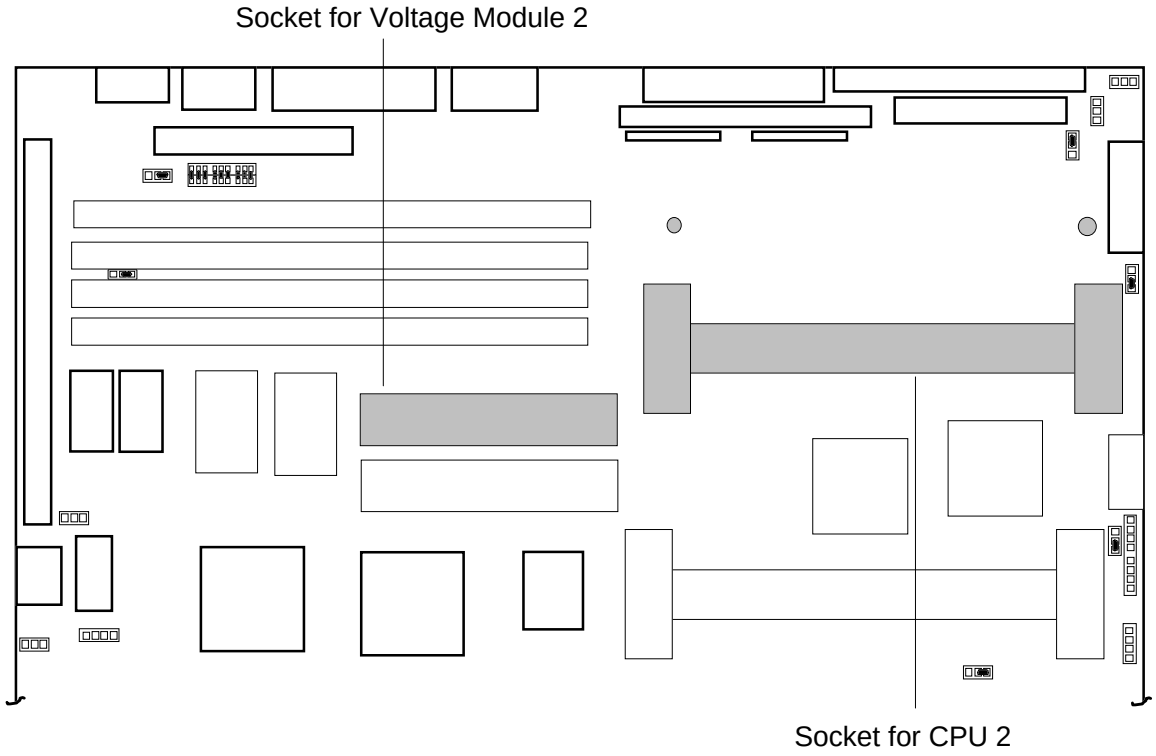
Installing a Processor

The system board has two sockets for Pentium II Processors. Figure 4-5 illustrates the location for the optional Pentium processor in your system. When adding a second processor, use the same type and speed as the processor shipped with your system. Contact your sales representative.

Notice: Installing a second processor that is of a different type than the first processor, will result in system damage. Do not touch or bend the processor's exposed pins.

Notice: The voltage module for CPU 2 should not be installed in a mono processor system.

Figure 4-5. Optional Pentium II Processor



The processor upgrade kit contains a voltage module, processor module, and heat sink with two heat sink clips. The heat sink has a heat transfer pad on the bottom. To install the second Pentium II processor upgrade kit:

Warning: If the system has been running, any processor and heat sink already installed on the board will be hot. To avoid the possibility of a burn, let the components cool for 10 minutes before continuing with the procedures described here

1. Power off the system and remove the side panel as described earlier in this chapter.

Notice: Observe static precautions. Use an antistatic wrist strap.

2. Remove the terminator card from the CPU 2 socket.

3. Position the heat sink on the processor module and insert the heat sink clips that secure the heat sink to the processor.

4. The processor module is keyed so it can only be inserted one way. Position the processor over the CPU 2 socket on the board and press down evenly on the processor until the latches on both sides lock in place correctly.

   Note: Be sure the Pentium II module side latches are pushed all the way out. Otherwise, the module will not be locked into the socket.

5. Locate the voltage module. The connector for the module (Figure 4-5) is keyed so it can only be inserted one way. Position the module over the socket on the board and press down evenly on the module until it seats correctly.

6. Move the CPU 2 jumper J50 from pins 2-3 to pins 1-2 (Figure 3-1).

7. Replace the side panel and turn on the system.

Removing a Processor

Refer to Figure 4-5 while performing the following procedures. To remove an Pentium II processor:

1. Power off the system and remove the side panel as described earlier in this chapter.

Notice: Observe static precautions. Use an antistatic wrist strap.

2. Remove the processor module from the CPU 2 socket by pressing the release latches on either side of the module and pulling the module out of the mounting bracket.

3. Remove the heat sink support pins from the heat sink support base and remove the heat sink base.

4. Install a terminator card into the CPU 2 socket.

5. Remove the CPU 2 voltage module.

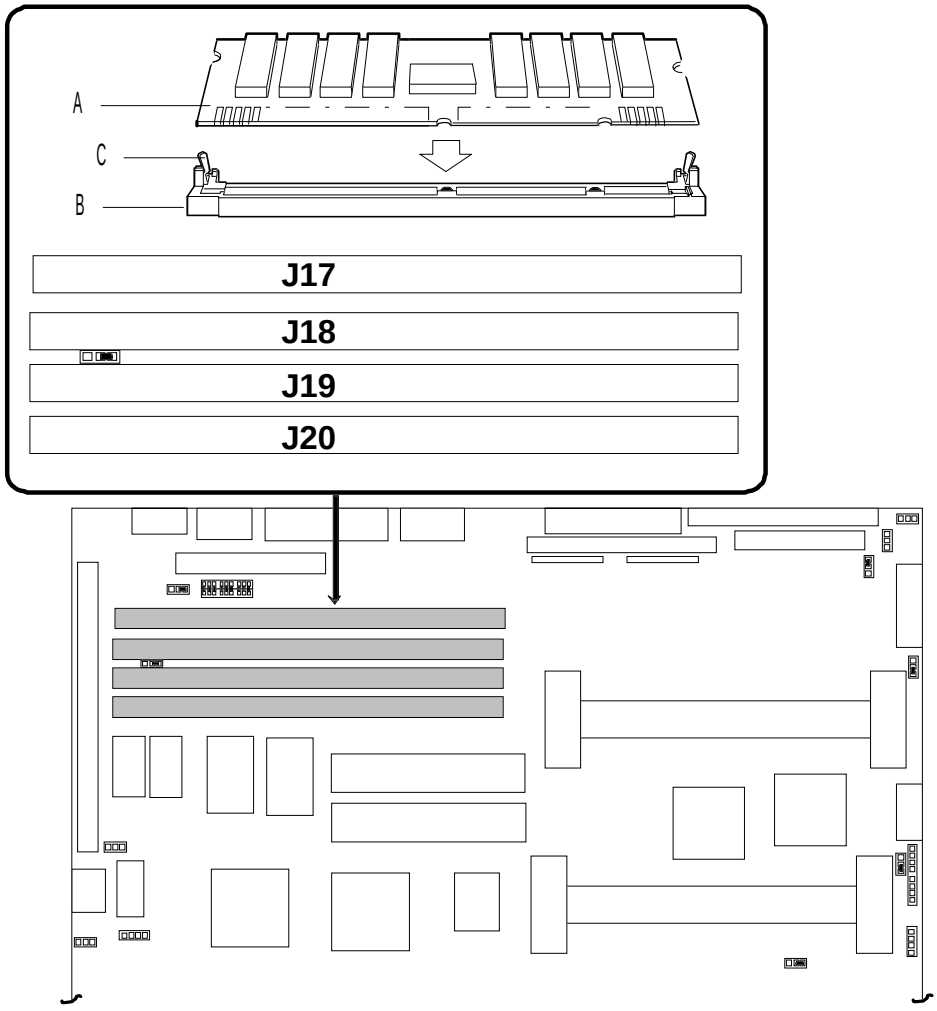
6. Move the CPU 2 jumper J50 from pins 1-2 to pins 2-3 (Figure 3-1).

7. Replace the side panel and turn on the system.

DIMMs

The system board contains four DIMM sockets labeled J17 through J20 (Figure 4-6). Each socket can hold a single 72-bit DIMM module with 32MB, 64MB, or 128MB of memory. When all four sockets are populated, the system board supports a maximum of 512MB of memory with 128MB DIMMs. A DIMM should be installed in the bottom (J20) socket. When you install additional DIMMs, you must start with the first empty socket above DIMMs already installed. When you remove DIMMs, you must start with the first DIMM socket closest to the top edge of the system board.

Figure 4-6. Inserting Memory DIMMs



Installing DIMMs

When properly installed, the DIMM module is oriented at an angle of 90 degrees relative to the system board.

1. Power off the system and remove the side panel as described earlier in this chapter.

Notice: Observe static precautions. Use an antistatic wrist strap. Hold DIMMs only by their edges.

2. Holding the DIMM module only by the edges, remove it from its antistatic package.

3. DIMMs are keyed so they can only be inserted one way. Position the DIMM over the socket on the board (Figure 4-6, A and B). The notches in the bottom edge of the DIMM mates with the raised bumps in the DIMM socket.

4. Press down evenly on the DIMM until it seats correctly. The white levers on the sockets are not "tools" to aid in the insertion, only to keep the DIMM's in place and to aid in extraction. The levers should click in place once the DIMM is fully inserted.

5. Repeat the above steps to install any remaining DIMMs.

6. Replace the side panel and turn on the system.

Removing DIMMs

Notice: Use extreme care when removing a DIMM. Hold DIMMs only by their edges. Place them on an antiststic surface; do not side them across any surface. Appying too much pressure can break the retaining clips or damage the socket slot. Apply only enough pressure on the retaining clips to release the DIMM.

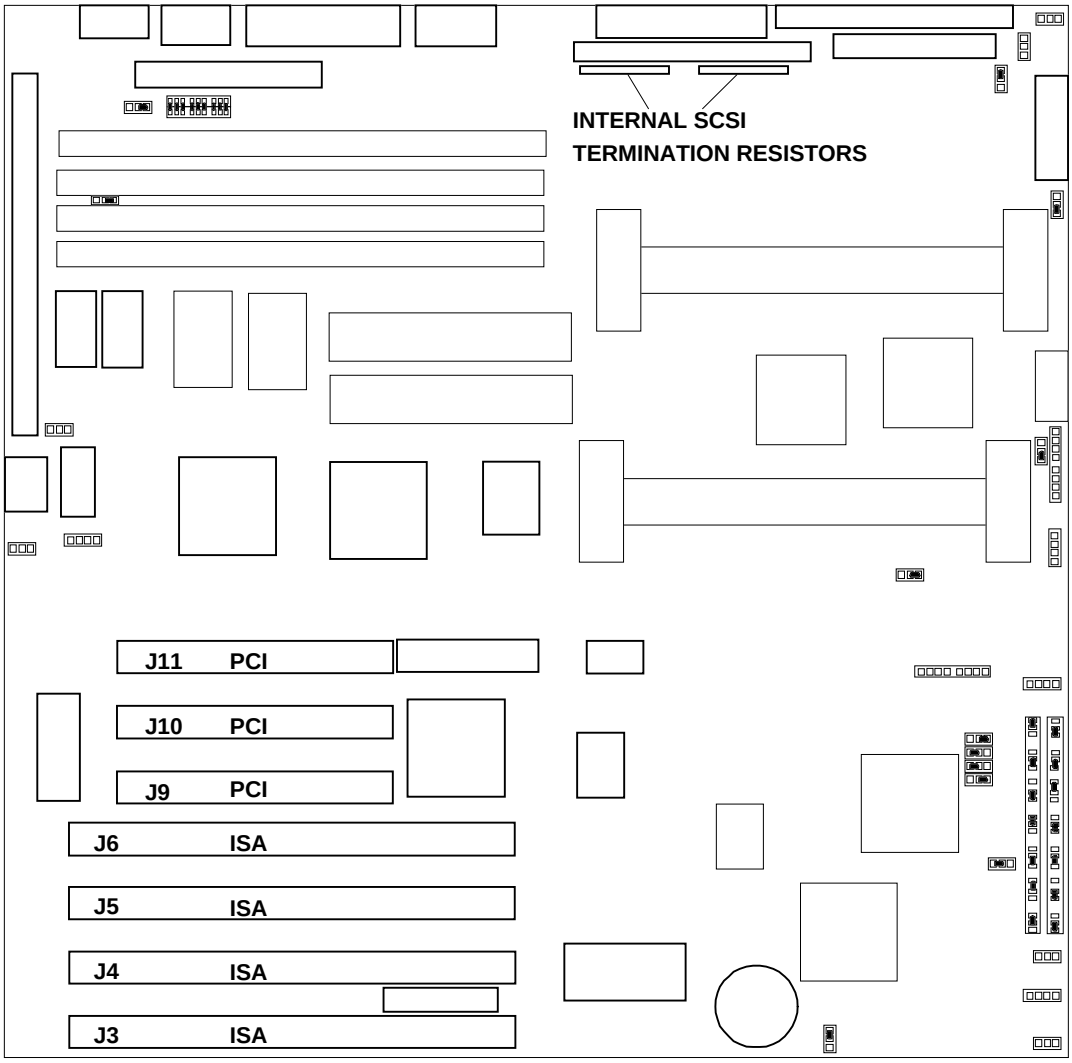
1. Power off the system and remove the side panel as described earlier in this chapter.
2. Remove the DIMM modules one at a time starting from the highest numbered sockets.
3. To remove each DIMM, gently spread the retaining clips (Figure 4-6, C) just enough so that you can pull the top edge of the DIMM (B) away from the clips.
4. Carefully lift the DIMM away from the socket and store it in an antistatic package.
5. Repeat the above steps to remove the remaining DIMMs.
6. Replace the side panel and turn on the system.

Option Boards

This section describes how to install and remove ISA and PCI option boards. The system board has three dedicated ISA bus expansion slots, two dedicated PCI bus expansion slots, and one combined ISA/PCI expansion slot. You can install one ISA board or one PCI board in the combined slot, not both. The expansion slots are shown in Figure 4-7.

The high-performance PCI local bus allows the adoption of newer networking technology, such as ATM and 100 MB/second Ethernet NICs, with a minimum of effort and without concern for I/O bottlenecks. The PCI local bus offers up to 133 MB/second bandwidth.

Figure 4-7. PCI and ISA Slot Locations



Installation Considerations

Newer adapters, designed for Plug-and-Play systems, are automatically configured by the system without any user intervention. Older ISA adapters must be manually configured as detailed below. Once the manual configuration is complete, the Plug-and-Play adapters are configured around the manually configured adapters without causing any resource conflicts.

ISA adapters can be Plug-and-Play. ISA adapters that are not Plug-and-Play must be manually configured following the instructions supplied with the board. The configuration is defined to the system by creating the ISA configuration file when running the RCU. For details on running the RCU, refer to Chapter 3.

Consider the following points when installing option boards:

- ISA bus priority is slot J3 - J6, slot J3 having the highest priority. ISA slot J3 is the bottom option board slot on the system board. See Figure 4-7 for ISA slot numbers.
- PCI bus priority is slot J11 - J9, slot J11 having the highest priority. PCI slot J11 is the top PCI option board slot on the system board. See Figure 4-7 for PCI slot numbers.
- On system power-up and reboot, BIOS initiates a scan sequence looking for Plug-and-Play option boards installed since the last power up or reboot. The Plug-and-Play scan sequence is as follows:

  First - BIOS scans for any Plug-and-Play ISA option board installed in slots J3 - J6, starting with slot J3.

  Second - BIOS scans for any Plug-and-Play PCI option board installed in slots J11 - J9, starting with slot J11.

  Always install option boards in the first available slot in the scan sequence. As an example, if there are ISA option boards installed in slots J3 and J4 of your system and slots J5 - J6 are vacant, install your Plug-and-Play option board into slot J5.

Controller/Adapter Hardware Configurations

Table 4-1 lists the option boards you may add to your system and provides information on slot location, memory and I/O addressing and assigned interrupt request number (IRQ).

Table 4-1. Option Board Hardware Configurations

OPTION BOARD	IRQ[3]	MEMORY ADDRESS	I/O ADDRESS	OPTION SLOT
SMC 8432BTA (1st)[4]	Set by BIOS	Set by BIOS	Set by BIOS	PCI Slot J9
SMC 8432BTA (2nd)[4]	Set by BIOS	Set by BIOS	Set by BIOS	PCI Slot J10
SMC 9332BDT (1st)[4]	Set by BIOS	Set by BIOS	Set by BIOS	PCI Slot J9
SMC 9332BDT (2nd)[4]	Set by BIOS	Set by BIOS	Set by BIOS	PCI Slot J10
SMC 9432TX (1st)[4]	Set by BIOS	Set by BIOS	Set by BIOS	PCI Slot J9
SMC 9432TX (2nd)[4]	Set by BIOS	Set by BIOS	Set by BIOS	PCI Slot J10
3COM 3c905B (1st) [4]	Set by BIOS	Set by BIOS	Set by BIOS	PCI Slot J9
3COM 3c905B (2nd) [4]	Set by BIOS	Set by BIOS	Set by BIOS	PCI Slot J10
Adaptec 2940UW[1]	Set by BIOS	Set by BIOS	Set by BIOS	PCI Slot J11[5]
Mylex DAC960PDU	Set by BIOS	Set by BIOS	Set by BIOS	PCI Slot J11
Onboard 7880 SCSI	Set by BIOS	Set by BIOS	Set by BIOS	N/A[2]
Onboard 7860 SCSI	Set by BIOS	Set by BIOS	Set by BIOS	N/A[2]

1. When more than 1 SCSI controller is plugged in, use IRQ 14 for secondary controller (non-booting controller).

2. For disk controllers plugged into slots and the onboard disk controllers, the sequence for BIOS scanning to determine the primary (Boot) disk controller is:

   ISA slots J3 through J6
   PCI slot J11
   Onboard 7880 SCSI
   PCI slots J10
   Onboard 7860 SCSI
   PCI slot J9.

   It is recommended that the BIOS be disabled on all SCSI controllers except for the controller with the boot disk drive attached (see The SCSISelect Utilities in the Configuring Your System chapter. This saves memory address resources and provides control over the boot device independent of board slot locations.

3. Additional IRQ's can be made available as follows:

   Disabling Comm Port 1 = IRQ4 is available
   Disabling Comm Port 2 = IRQ3 is available
   Disabling Parallel Port = IRQ7 is available.

4. A maximum of three LAN channels consisting of any combination of single or dual channel. Install ISA LAN card in the first available ISA slot from the bottom. Install PCI LAN card in the first available PCI slot from the top.

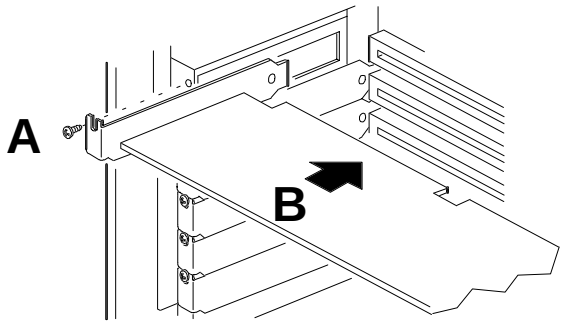
5. A maximum of two SCSI controllers may be installed. Install the first controller card in the top PCI slot and the second controller in the second from the top PCI slot.

Installing an Option Board

1. Power off the system and remove the side panel as described earlier in this chapter.

2. Remove and save the expansion slot screw and cover (Figure 4-8, A).

Figure 4-8. Installing an Option Board



Notice: Observe static precautions. Use an antistatic wrist strap.

3. Remove the option board from its protective wrapper, holding the board only by the edges. Do not touch the board components or the gold connectors.

4. Record the option board serial number in the equipment log.

5. Set any board jumpers or switches as described in the documentation that comes with the option board.

   Note: Refer to the documentation accompanying the option board for information on whether the board is to be installed in a PCI or ISA expansion slot.

6. Refer to Table 4-1 to determine the recommended option board slot assignment and configuration parameters. Refer to Figure 4-7 to determine system board slot locations.

7. Holding the board by its top edge or upper corners, firmly press the board into an expansion slot on the system board. The tapered foot of the option board retaining bracket must fit into the mating slot in the expansion slot frame (Figure 4-8, B).

8. Align the rounded notch in the retaining bracket with the threaded hole in the expansion slot frame. The retaining bracket fits into the space that was occupied by the expansion slot cover.

9. Reinstall the screw in the threaded hole. Be sure to push the bracket slot up against the screw before you tighten it. If this is not done, the bracket may interfere with an adjacent bracket.

10. If you have installed a SCSI host adapter board, go to Appendix A for procedures on cabling these boards into the system. For all other boards, continue with Step 11.

11. Connect any external cables (if they are needed) to the installed option board.

12. Replace the side panel, power on the system, and run the RCU if you have installed any non-Plug-and-Play ISA option boards.

Removing an Option Board

Note: Expansion slot covers must be installed on all vacant slots to maintain the electromagnetic emissions characteristics of the system and to assure proper cooling of the system components.

1. Power off the system and remove the side panel as described earlier in this chapter.

2. Disconnect any cables attached to the option board you are removing.

3. Remove and save the option board retaining bracket screw.

4. Hold the board at each end, and carefully rock it back and forth until the edge connectors pull free. Make sure that you do not scrape the board against other components.

5. Remove the board from the expansion slot and place it in an antistatic wrapper.

6. If you are replacing a board, go to "*Installing an Option Board*" earlier in this chapter, otherwise continue.

7. Install an expansion slot cover over the vacant slot using the previously removed screw.

8. Replace the side panel and power on the system.

9. If you removed an non-Plug-and-Play ISA option board, run the RCU to configure the system as described in the *Configuring Your System* chapter.

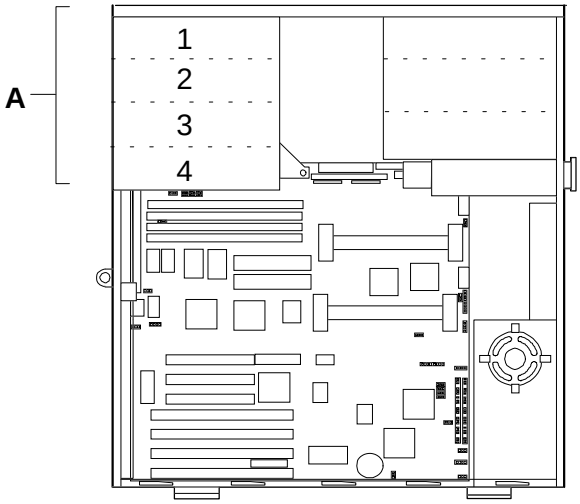
Hard Disk Drives

The system supports a variety of SCSI devices. Contact your sales representative or dealer for a list of approved devices. The internal hard disk drives are located in the 3.5-inch drive bay (Figure 4-9, A).

Notice: The system uses single-ended SCSI host adapter and devices. Failure to install single-ended SCSI drive types can result in electrical damage to the host adapter and the peripherals.

Notice: The "Terminator Enable" jumper must be installed in the last hard disk drive of the daisy chain cabling (top drive bay 1, SCSI ID = 0). The SCSI terminators must be removed from all other drives.

Figure 4-9. 3.5-Inch Drive Bay Locations



SCSI ID ASSIGNMENT

BAY	DEVICE	ADDRESS
1	First Hard Disk	0
2	Second Hard Disk	1
3	Third Hard Disk	3
4	Fourth Hard Disk	4

Installing an Internal SCSI Hard Disk Drive

1. Power off the system and remove the side panel as described earlier in this chapter.

Notice: Observe static precautions. Use an antistatic wrist strap.

2. Remove the 3.5-inch hard disk drive from its protective wrapper. Record the drive model and serial number in the equipment log.

3. Set any drive jumpers or switches as described in the installation procedures that came with the device.

Notice: If a drive bezel is installed, it must be removed because it blocks the air flow around the drive.

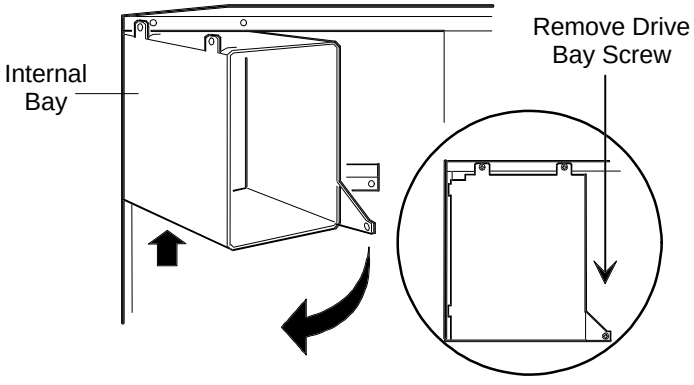
Notice: The "Terminator Enable" jumper must be installed in the last hard disk drive of the daisy chain cabling (top drive bay 1, SCSI ID = 0). The SCSI terminators must be removed from all other drives.

4. Remove the screw holding the 3.5-inch drive bay to the chassis (Figure 4 -10).

5. Disconnect the power and signal cables from the installed drives.

6. Swing the drive bay out of the chassis.

Figure 4-10. Removing the 3.5-inch Drive Bay



7. Slide the drive bay towards the top of the chassis until the tabs on the bay are free from the chassis. Remove the drive bay from the chassis and place it on an antistatic surface.

8. Install the hard disk drive component side down. Slide the drive into the bay until the screw holes line up. It may be necessary to temporarily loosen the mounting screws on the already installed drives to position the new drive. Secure the drive to the bay with the four supplied screws.

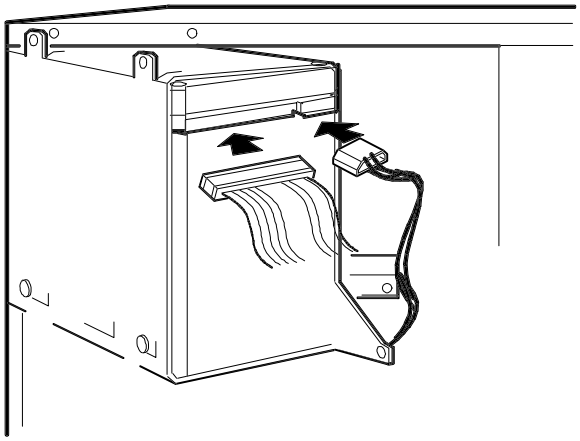
9. Replace the 3.5-inch drive bay. Insert the tabs into their slots on the chassis. Slide the drive bay towards the bottom of the chassis until the tabs hit their stops.

10. Connect the signal and power cables to the drives as shown in Figure 4-11.

    Note: All device power cables are labeled and must be installed in specific locations as shown in Figure 4-11. Also, the hard drive cabling configuration may be different in your system if your system includes the DAC960PDU Disk Controller Board. However, cable connections to the hard disk drives are the same.

11. Swing the drive bay into the chassis and replace the 3 screws on the drive bay.

Figure 4-11. Cabling Hard Disk Drives



DRIVE LOCATION	POWER CONNECTOR
1	PS12
2	PS4
3	PS5
4	PS13

12. Replace the side panel and power on the system. Configure the system as described in the *Configuring Your System* chapter.

Removing an Internal SCSI Hard Disk Drive

1. Power off the system and remove the side panel as described earlier in this chapter.
2. Disconnect the signal and power cables from the back of the drive (Figure 4-11). It is necessary to completely remove the cables from all the drives before the drive can be removed.
3. Remove the screws holding the 3.5-inch drive bay to the chassis (Figure 4 -10).
4. Swing the drive bay out of the chassis.
5. Slide the drive bay towards the top of the chassis until the tabs on the bay are free from the chassis. Remove the drive bay from the chassis and place it on an antistatic surface.
6. Remove the hard disk drive by removing the four screws that secure the drive to the drive bay.

   Note: There must be a drive in bay 1 with the "Terminator Enable" jumper installed.
7. Replace the 3.5-inch drive bay. Insert the tabs into their slots on the chassis. Slide the drive bay towards the bottom of the chassis until the tabs hit their stops.
8. Connect the signal and power cables to the drives as shown in Figure 4-11.

   Note: The hard drive cabling configuration may be different in your system if your system includes the DAC960PDU Disk Controller Board. However, cable connections to the hard disk drives are the same.

   Note: Verify that all cables are seated and routed properly.
9. Replace the 3 screws on the drive bay. Replace the side panel and power on the system.

10. Remove the drive serial number from the equipment log.

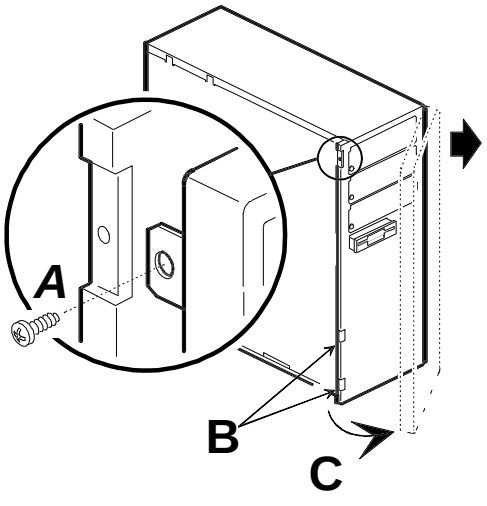
Front Panel

The plastic front panel assembly is a one piece assembly with removable filler panels. If you are installing peripheral devices in the external bays above the 3.5-inch floppy disk drive, you must remove the appropriate filler panels.

Removing the Front Panel

1. Power off the system and remove the side panel as described earlier in this chapter.
2. Remove the screw securing the front panel to the chassis (Figure 4-12, A).
3. Squeeze the plastic tabs inside the front panel so they clear the chassis slots (Figure 4-12, B).
4. Pull the left side of the panel out slightly until the power and reset buttons are free. Slide the panel to the right until the panel tabs come out of the slots in the chassis (Figure 4-12, C).

Figure 4-12. Removing the Front Panel



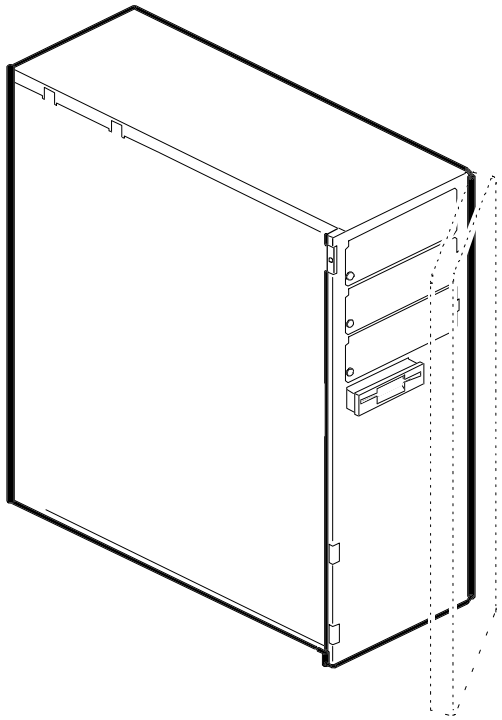
Installing the Front Panel

1. Insert the metal tabs of the front panel into the slots on the right side of the chassis (Figure 4-13). Squeeze the front panel and the chassis together along the left side so the tabs snap into their slots. Replace and tighten the screw.

2. Install the side panel as described earlier in this chapter.

3. Power on the system as described earlier in this chapter.

Figure 4-13. Installing the Front Panel



Removing EMI Shields and Filler Panels

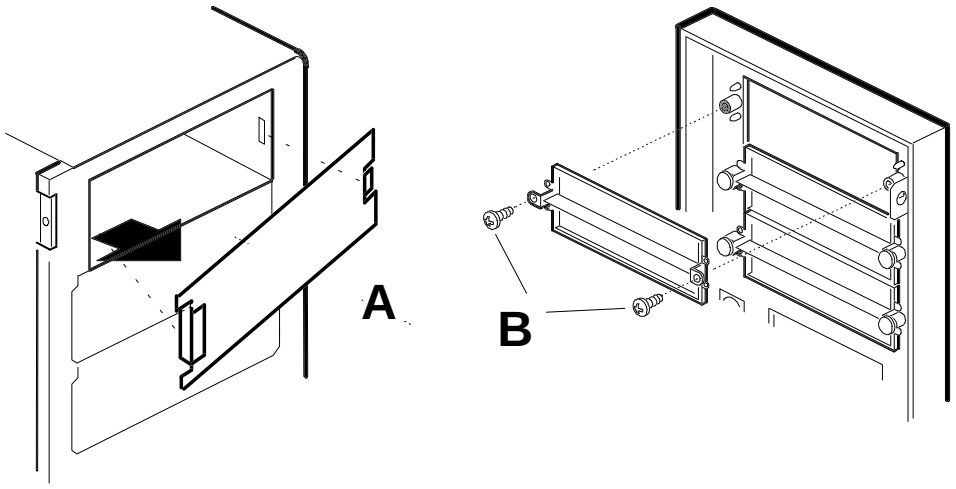
1. Power off the system as described earlier in this chapter.

2. Remove the front panel as described earlier in this chapter.

3. The EMI (Electromagnetic Interference) shield is released by pressing the tab on the left side of the shield to right. Remove the EMI shield covering the bay into which you are installing a peripheral device. Save the shield for reinstallation. See Figure 4-14, A.

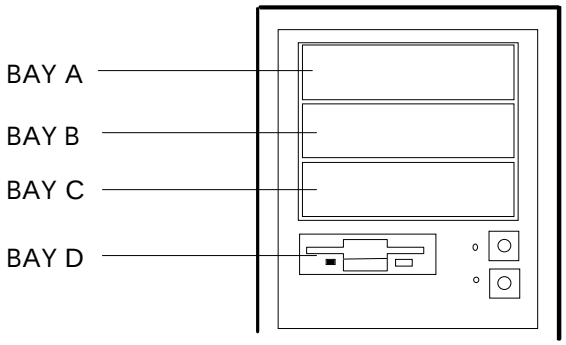
4. Remove the screws and filler panel covering the bay into which you are installing a peripheral device. Save the panel and screws for reinstallation. See Figure 4-14, B.

Figure 4-14. EMI Shield and Filler Panels Removal



Removable Media Devices

Removable media devices can be installed in peripheral bays A, B, and C. An IDE CD-ROM drive is always mounted in bay A. A 3.5-inch diskette drive is always mounted in bay D. Other IDE or SCSI optional devices should be installed in the first available bay from the top (bay A). The following table illustrates the recommended removable media configuration.



Bay A IDE CD-ROM (master device) (always installed)
Bay B IDE Tape (slave device) or 1st SCSI Tape (SCSI address 2) Device must have the internal SCSI terminators installed.
Bay C 2nd SCSI Tape (SCSI address 5) Device must have the internal SCSI terminators removed.
Bay D 1.44M floppy (always installed)

Notice: When using SCSI optional devices, the system board internal SCSI termination resistors (see Figure 4-7) must be removed and the SCSI termination resistors must be installed in the last SCSI drive of the daisy chain cabling. All other SCSI devices must have their terminators removed.

Notice: When using an IDE optional device, the device jumper must be set as the slave device.

Installing a 5.25-Inch Device

Caution: CD-ROM devices contain a laser system and are classified as CLASS 1 LASER PRODUCTS. In case of any trouble with a CD-ROM, please contact your nearest service representative. To prevent direct exposure to the laser beam, do not try to open the enclosure.

Use of controls or adjustments or performance of procedures other than those recommended by the manufacturer may result in hazardous radiation exposure

Note: Contact your sales representative or dealer for a list of approved optional peripheral devices.

1. Power off the system and remove the side panel as described earlier in this chapter.
2. Remove the front panel as described earlier in this chapter.

Notice: Observe static precautions. Use an antistatic wrist strap.

3. Remove the device from its protective wrapper and place it on an antistatic surface. Record the drive model and serial number in the equipment log.
4. Set any drive jumpers or switches before you install the drive. See the documentation that comes with the device for jumper or switch information.

Notice: When using SCSI optional devices, the SCSI termination resistors must be installed in the last SCSI device of the daisy chain cabling. All other devices must have terminators removed.

Notice: When using an IDE optional device, the device jumper must be set as the slave device.

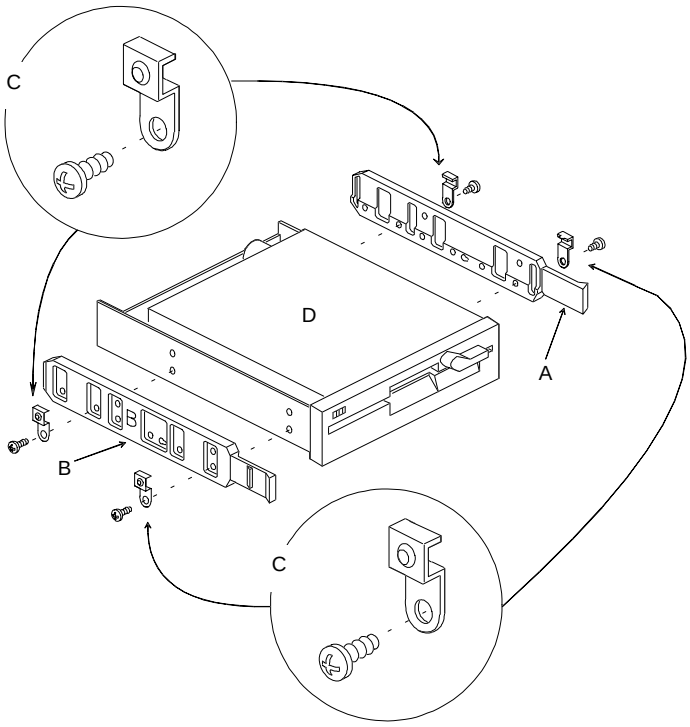
5. Using the screws and grounding clips supplied with the drive, attach a plastic snap-in slide rail marked "A" (Figure 4-15, A) to the right side of the device (D). Install a grounding clip (C) under each screw head.

6. Attach a plastic snap-in slide rail marked "B" (B) to the left side of the device (D). Install a grounding clip (C) under each screw head.

7. Position the device so that the plastic slide rails on each side of the device engage the peripheral bay guide rails.

8. Push the device into the bay until the slide rails lock in place.

Figure 4-15. Attaching Slide Rails to a Device



9. Locate and connect the power cable (Figure 4-16) to the device; the connector is keyed and can be inserted only one way.

   Note: All power cables are labeled and must be connected to the devices as shown in Figure 4-16.

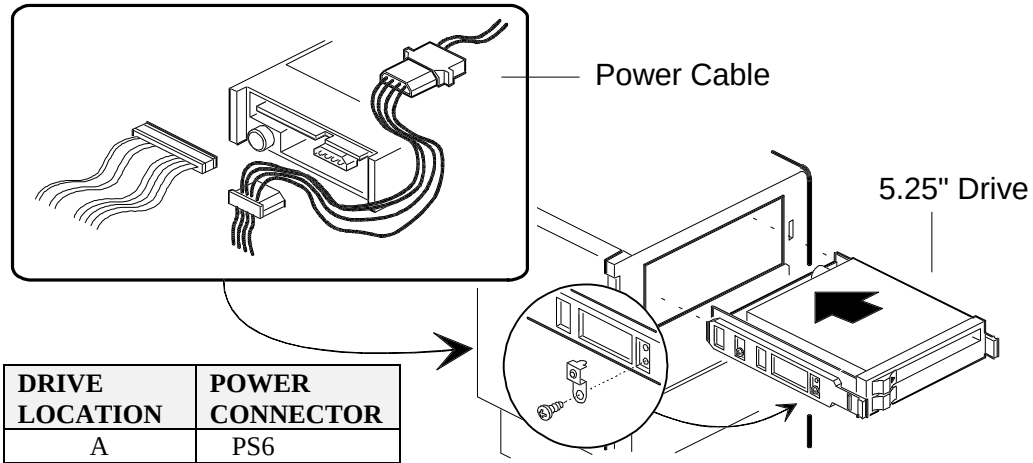
10. Locate and connect the ribbon data cable (Figure 4-16) to the device; the connector is keyed and can be inserted only one way.

    Note: If you are installing a SCSI device, be certain to use the 50-pin internal SCSI data cable. This cable comes from J36 on the system board to the externally accessible bays and ends at the last SCSI device. Do not confuse this cable with the 34-pin diskette drive cable which begins on J12 of the system board and ends at the diskette in bay D or the 40-pin IDE drive cable which begins on J38 of the system board and ends at the CD-ROM in bay A.

11. Ensure that the peripheral filler panel is removed from the front panel.

12. Replace the front panel and side panel, and power on the system.

Figure 4-16. Installing a Device into the System



DRIVE LOCATION	POWER CONNECTOR
A	PS6
B	PS7
C	PS8

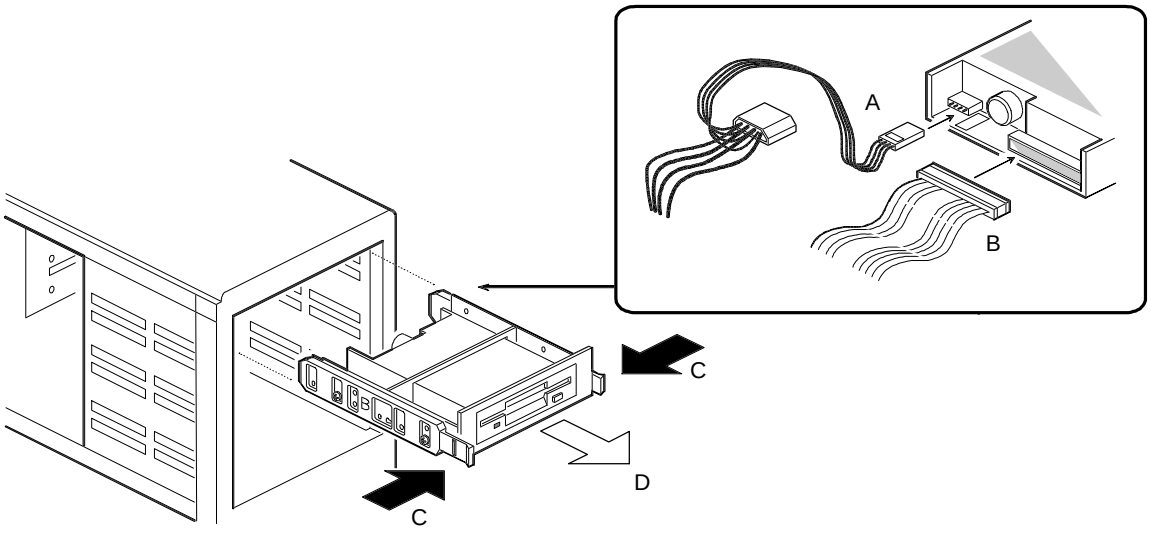
Removing a 5.25-Inch Device

1. Power off the system and remove the side panel as described earlier in this chapter.

2. Remove the front panel as described earlier in this chapter.

3. Disconnect the power cable (Figure 4-17, A) and ribbon data cable (B).

Figure 4-17. Removing a Device



4. Squeeze the protruding plastic snap-in rails (Figure 4-17, C) towards each other and carefully slide the device forward (D).

5. Each plastic, snap-in slide rail is attached to the device with two screws. An EMI/ESD grounding clip is installed under each of the screw heads.

6. Remove and save the four screws, four ground clips, and two snap-in slide rails from the device.

7. Install an EMI (Electromagnetic Interference) shield over the bay from which you removed the peripheral device.

8. Install the appropriate filler panel into the front panel.

9. Replace the side panel and front panel, and power on the system.

10. Remove the drive serial number from the equipment log.

3.5-Inch Diskette Drive

You may need to replace the 3.5-inch diskette drive located in bay D. Contact your sales representative or dealer for a list of approved devices.

Removing the 3.5-Inch Diskette Drive

1. Power off the system and remove the side panel as described earlier in this chapter.

Notice: Observe static precautions. Use an antistatic wrist strap.

2. Disconnect the power cable and signal cable from the rear of the diskette drive. Note the orientation of the red (pin 1) cable.

3. Remove the screw that secures the diskette carrier to the front bay (Figure 4-18).

4. Slide the diskette carrier back until the tabs hit their stops. Pull the carrier away from the front bay and remove it from the chassis.

5. Remove the screws that hold the diskette drive to the carrier (Figure 4- 19).

6. Slide the diskette drive out of the carrier.

7. Proceed to the next section to install a replacement diskette drive.

Figure 4-18. Removing the Diskette Carrier

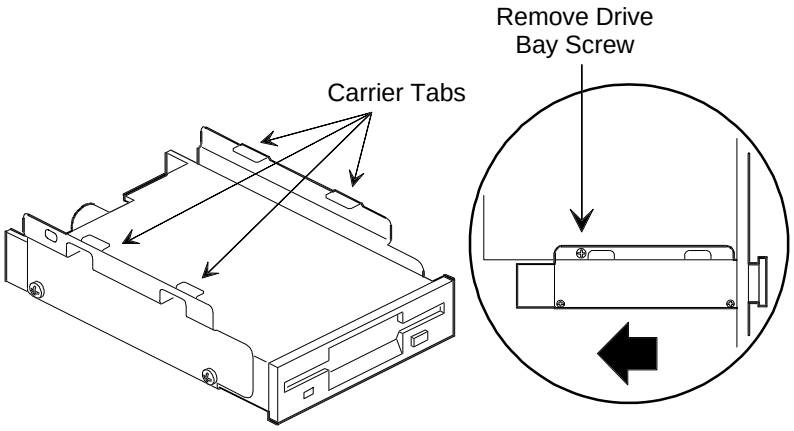
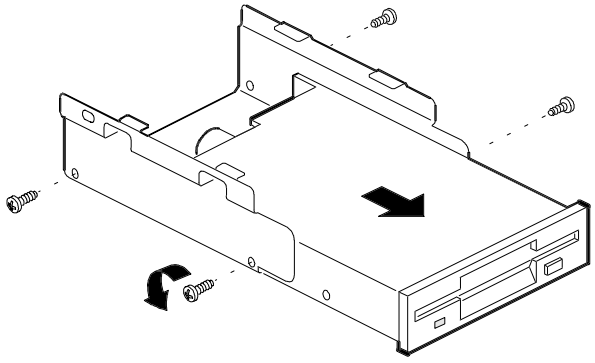


Figure 4-19. Removing the Diskette Drive



Replacing the 3.5-Inch Diskette Drive

Notice: Observe static precautions. Use an antistatic wrist strap.

1. If the system is on, power off the system and remove the side panel as described earlier in this chapter.

2. Remove the replacement diskette from its protective wrapper and place it on an antistatic surface. Record the drive model and serial number in the equipment log.

3. Slide the replacement diskette drive into the diskette carrier. Line up the holes on the carrier with the screw holes on the diskette drive. Insert and tighten the screws.

4. Insert the tabs on the diskette carrier into their slots on the bottom of the bay. Slide the carrier forward until the screw hole in the bay and the hole in the carrier line up. Insert the screw that secures the carrier to the front bay and tighten.

5. Attach the power cable labeled PS9 and the signal cable to the rear of the diskette drive. Ensure that the signal cable is properly oriented as noted during removal.

   Note: If the diskette signal cable is improperly oriented, the diskette activity light remains on after the BIOS POST test.

   The red wire on the power supply cable and the red wire on the data cable, with the twist, should mirror each other. Mirrored means that if the red wire on the power supply cable faces towards the middle, pin 1 of the data cable also faces to the middle and vice versa.

6. Power on the system.

Chapter 5

Problem Solving

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This chapter helps you identify and solve problems that may occur during system installation or while using your system. The first section of this chapter tells you how to reset your system in the event of problems. The next few sections provide troubleshooting checklists and procedural steps that help you isolate specific system problems. The last section includes BIOS user information.

Warning: The DC push-button on/off switch on the front panel does not turn off the system AC power. Before doing the procedures in this chapter, make sure that your system is powered off and unplug the AC power cord from the back of the chassis. Failure to disconnect power before opening your system can result in personal injury and equipment damage.

Resetting the System

There are two ways to reset the system:

Reset button

Pushing the reset button clears the system memory, restarts the POST, and reloads the operating system.

Power off/on

Turning the power off and then on with the push-button switch on the front panel has the same effect as pushing the reset button, except that power is halted to all peripherals.

Troubleshooting Checklists

The following subsections provide troubleshooting checklists for problems that occur at initial system startup, when you run new application software, and after the system hardware and software have been running correctly.

Initial System Startup

Problems that occur at initial system startup are usually caused by incorrect installation or configuration. Hardware failure is a less frequent cause. If you have problems during initial system startup, check the following:

- Is the system power cord properly connected to the system and plugged into a NEMA 5-15R outlet (100-120 V ac) or a NEMA 6-15R outlet (200-240 V ac)?
- Is the line voltage selector switch on the back of the power supply set to the correct input voltage. See *Setting the Line Voltage* in the Setting Up Guide.
- Is AC available at the wall outlet?
- Is the power on/off push-button switch on the front panel in the ON position (power on LED should be lit)?
- Are all cables correctly connected and secured?
- Are all the PCI/ISA option boards fully seated in their connector slots on the system board?
- Are all jumper settings on the system board correct? For jumper information, see the *Configuring Your System* chapter.
- Are all jumper and switch settings on option boards and peripheral devices correct? To check these settings, see the respective appendices. If applicable, ensure that there are no conflicts; for example, two option boards sharing the same interrupt.

- Are all DIMMs fully seated and installed correctly? Refer to the *Upgrades and Options* chapter for installation instructions.
- Are all option boards and disk drives installed correctly? Refer to the *Upgrades and Options* chapter.
- If the system has a hard disk drive, is it properly formatted or defined?
- Is the operating system properly loaded? Refer to the operating system documentation.
- Are all drivers properly installed? For information about installing drivers, refer to your network operating system configuration guide.
- Are the configuration settings in Setup and the Resource Configuration Utility (RCU) correct? For information about running these utilities, refer to the *Configuring Your System* chapter.

If the above items are all correct, but the problem reoccurs, refer *to Additional Troubleshooting Procedures* in this chapter.

Running New Application Software

Problems that occur when you run new application software are usually related to the software. Faulty equipment is much less likely, especially if other software runs correctly. If you have problems while running new application software, check the following:

- Does the system meet the minimum hardware requirements for the software? Refer to the software documentation.
- Is the software an authorized copy? Unauthorized copies often do not work. Obtain an authorized copy of the software.
- If you are running the software from a floppy disk, is it a good copy?
- If you are running the software from a hard disk drive, is the software correctly installed? Were all necessary procedures followed and files installed?
- Are the correct device drivers installed?
- Is the software correctly configured for the system?
- Are you using the software correctly?
- Try a different copy of the software to see if the problem is with the copy you are using.
- If other software runs correctly on the system, contact your vendor about the failing software.

If the problems persist with the software, contact the software vendor's customer service representative.

After System Has Been Running Correctly

Problems that occur after the system hardware and software have been running correctly often indicate equipment failure. However, many situations that are easy to correct can also cause such problems. If you have problems after the system has been running correctly, check the following:

- If you are running the software from a floppy disk, try a new copy of the software.
- If you are running the software from a hard disk drive, try running it from a floppy. If the software runs correctly, there may be a problem with the copy on the hard disk. Reinstall the software on the hard disk drive and try running it again. Make sure all the necessary files are installed.
- If the problem recurs, you may need to reformat the hard disk drive. The drive, the drive controller, or the system board may be defective.
- If the problems are intermittent, there may be a loose cable, dirt in the keyboard (if keyboard input is incorrect), a marginal power supply, or other random component failures.
- If you suspect that a transient voltage spike, power outage, or brownout might have occurred, reload the software and try running it again. Symptoms of voltage spikes include a flickering video display, unexpected system reboots, and the system not responding to user commands.

  Note: Voltage spikes can corrupt or destroy data files on the drive. If you are experiencing voltage spikes on the power line, install a surge suppresser between the power outlet and the system power cord.

If the problem recurs after you have checked and corrected all of the above items, refer to *Additional Troubleshooting Procedures* in this chapter.

Additional Troubleshooting Procedures

This section provides a more detailed approach to diagnostic testing and identification of a problem and locating its source.

Error Checking

Each time you turn on the system, the POST runs automatically and checks the system board, CPU module, memory, keyboard, and most installed peripheral devices.

If POST finds an error, it displays an error message and, in case there is a problem with the display, puts out a series of long and short beeps. One short beep means the system passed POST. Refer to the *BIOS User's Information* section in this chapter for a list of items to check for each error code and for an explanation of the error beep codes.

Troubleshooting Guide

Use the following troubleshooting procedures to help you identify a problem. These general procedures lead you through the following:

- Preparing the system for diagnostic testing
- Monitoring POST while it is running
- Verifying proper operation of key system LEDs
- Confirming loading of the operating system.

Preparing the System for Diagnostic Testing

To prepare the system for diagnostic testing, perform the following:

Notice: Before disconnecting any peripheral cables from the system, turn off the system and any external peripheral devices. Failure to do so can cause permanent damage to the system and/or the peripheral devices.

1. Turn off the system and all external peripheral devices. Disconnect all devices from the system except the keyboard and video monitor.

2. Make sure the system power cord is plugged into a properly grounded AC outlet.

3. Make sure your video display monitor and keyboard are correctly connected to the system. Turn on the video monitor. Set its brightness and contrast controls to at least two-thirds of their maximum ranges (refer to the documentation supplied with your video display monitor).

4. If the operating system normally loads from the hard disk drive, make sure there is no diskette in drive A. Otherwise, place a diskette containing the operating system files in drive A.

5. Turn on the system. If the power indicator LED does not light, refer to *Power Light Does Not Light* found later in this chapter.

Monitoring POST while it is running

Each time you turn on the system, the power-on self-test (POST) runs automatically and checks the system board, CPU, memory, keyboard, and most installed peripheral devices.

During the memory test, POST displays the amount of memory that it is able to access and test. Depending on the amount of memory, it may take several minutes to complete the memory test.

Press F2 key if you want to run SETUP

If you do not press <F2>, the above message remains for a few seconds, the system beeps once, and the boot process continues.

If POST finds an error, it displays an error message and, in case there is a problem with the display, puts out a series of long and short beeps. Write down any beep code emitted. This information is useful to your service representative.

One short beep means the system passed POST. Refer to the *BIOS User's Information* section in this chapter for a list of items to check for each error code and for an explanation of the error beep codes.

Table 5-1 lists keys active during POST and provides a description of errors that may occur.

The BIOS indicates errors by writing an error code to the PS/2-standard logging area in the Extended BIOS Data Area, and by displaying a message on the screen, which is sometimes preceded by the POST Error Code. The error code will also be logged to the Event Logging area.

Report any error code to your service representative.

Table 5-1. POST Keys and Errors

ACTION/MESSAGE	DESCRIPTION
If POST Beeps Before Video Appears	Initialization failed before video initialized. Most beep code errors are fatal; initialization cannot continue. Refer to the section *BIOS User's Information* in this chapter.
If Monitor Displays Error	Note error; press F1 to continue boot or F2 to enter Setup. Refer to the section *BIOS User's Information* in this chapter.
To Enter Setup	Use Setup utility before using Resource Configuration Utility (RCU) to configure entire system. Setup changes specific options, then writes to CMOS, NVRAM. Press F2 during initialization to run Setup. If you do not press F2, the boot process continues.
POST Beeps	Initialization has completed.
Enter BOOT Diskette	If prompted, insert the boot diskette.

Verifying Proper Operation of Key System Indicators

As POST determines the system configuration, it tests for the presence of each mass storage device installed in the system. As each device is checked, its activity indicator should turn on briefly. Check for the following:

- Does the diskette drive activity indicator turn on briefly. If not, refer to Diskette *Drive Activity Indicator Does Not Light* in this chapter.
- If a second diskette drive is installed, does its activity indicator turn on briefly. If not, refer to *Diskette Drive Activity Indicator Does Not Light* in this chapter.
- If there is a hard disk drive or SCSI devices installed in the system, does the hard disk drive activity indicator turn on briefly. If not, refer to *Hard Disk Drive Activity Indicator Does Not Light* in this chapter.

Confirming Loading of the Operating System

Once the system boots up, the operating system prompt appears on the screen. The prompt varies according to the operating system. If the operating system prompt does not appear, refer to *Problems With Application Software* found later in this chapter.

Specific Problems and Corrective Actions

This section provides possible solutions for the following specific problems:

- Power LED does not light
- System cooling fans do not rotate
- No characters appear on screen
- Characters on the screen appear distorted or incorrect
- No beep or incorrect beep pattern
- Floppy disk drive access LED does not light
- Hard disk drive access LED does not light
- The RCU does not boot
- Problems with application software.

Try the solutions in the order given. If you cannot correct the problem, contact your service representative for assistance.

Power LED Does Not Light

Check the following:

- Is the system operating normally? If so, the power LED is probably defective.
- Are there other problems with the system? If so, check the items listed under System Cooling Fans Do Not Rotate.

System Cooling Fans Do Not Rotate

Note: The system has two cooling fans: one is mounted on the chassis panel behind the front panel and the other is an integral part of the power supply. There are no serviceable components inside the power supply. If the power supply is opened, the manufacturer's warranty is voided.

Check the following:

- Is AC power available at the wall outlet?
- Is the system power cord properly connected to the system and the AC wall outlet?
- Is the voltage switch setting correct for your line voltage?
- Is the power connector for the cooling fan connected to the system board?
- Is the front panel power on indicator lit?
- Is the cable from the front panel board connected to the system board?

If the switches and connections are correct and the power outlet is functioning, the power supply has probably failed. Contact your service representative for assistance.

No Characters Appear On Screen

Check the following:

- Is the riser card fully seated in the system board connector? The riser card is the small card that the mouse and keyboard plug into.
- Is the keyboard working?
- Is the video display plugged in and turned on?
- Are the brightness and contrast controls properly adjusted?
- Are the video display switch settings correct?
- Is the video display signal cable properly installed?

If you are using an option video controller board, perform the following:

1. Verify that the video controller board is fully seated in the system board connector.
2. Run the RCU to disable the onboard video controller.
3. Reboot the system for changes to take effect.

If there are still no characters on the screen after you reboot the system, contact your service representative or authorized dealer for assistance.

POST emits one long beep and two short beeps pattern to indicate a possible problem with the video display controller. If you do not receive a beep pattern and characters do not appear, the video display or video controller may have failed. Contact your service representative or authorized dealer for assistance.

Characters are Distorted or Incorrect

Check the following:

- Are the brightness and contrast controls properly adjusted on the video display? Refer to the documentation supplied with your video display.
- Are the video display signal and power cables properly installed?
- Is the RCU configuration set up correctly for the type of monitor you have attached to the system?
- If the problem persists, the video display may be faulty or it may be the incorrect type. Contact your service representative for assistance.

Incorrect Or No Beep Code

Check the following:

- Is the speaker enabled?
- Is the speaker cable connected to the system board?

If the system operates normally, but there was no beep, the speaker may be defective. Verify that the speaker is enabled by running Setup. For information about running Setup, refer to the *Configuring Your System* chapter. If the speaker is enabled, but not functioning, contact your service representative for assistance.

Record the beep code emitted by POST and refer to the Error Messages section, for information about beep pattern error messages.

Floppy Disk Drive Activity LED Does Not Light

Check the following:

- Are the floppy disk drive power and signal cables properly installed?
- Are all relevant switches and jumpers on the floppy disk drive set correctly?
- Is the floppy disk drive properly configured in Setup?

If you are using the onboard floppy disk controller, use Setup or the RCU to make sure that Onboard Floppy is set to Enabled. Conversely, to use an optional fixed/floppy disk controller, make sure that Onboard Floppy is set to Disabled. For information about running Setup or the RCU, refer to the *Configuring Your System* chapter.

If the problem persists, there may be a problem with the floppy disk drive, system board, or drive signal cable. Contact your service representative for assistance.

Hard Disk Drive Activity LED Does Not Light

If you have installed one or more hard disk drives in your system, check the following:

- Are the power and signal cables to the hard disk drive properly installed?
- Is the optional disk controller board fully seated in the system board connector?
- Are all relevant switches and jumpers on the hard disk drive and controller board set correctly?
- Are the jumpers on the system board set correctly?
- Is the hard disk controller properly configured in the RCU?
- Is the hard disk activity LED cable connector plugged into the optional controller board, if present?

If you received error messages, refer to the *Error Messages* section for information about error messages.

If you did not receive error messages, run the RCU to make sure that the hard disk drive is configured with the correct parameters. For information about running the RCU, refer to the *Configuring Your System* chapter.

If the problem persists, there may be a problem with the hard disk drive, the optional controller board, system board, drive signal cable, or LED connector. Contact your service representative for assistance.

Problems with Application Software

If you have problems with application software, perform the following:

- Verify that the software is properly configured for the system. Refer to the software installation and operation documentation for instructions on setting up and using the software.
- Verify a different copy of the software to see if the problem is with the copy you are using.
- Make sure all cables are installed correctly.
- Verify that the system board jumpers are set correctly. Refer to the *Configuring Your System* chapter for jumper settings.
- If other software runs correctly on the system, contact your vendor about the failing software.

If the problem persists, contact the software vendor's customer service representative for assistance.

BIOS User's Information

This section describes the various screen messages and beep codes of the system BIOS. The BIOS indicates errors by writing an error code to the PS/2-standard logging area in the Extended BIOS Data Area, and by displaying a message on the screen, which is sometimes preceded by the POST Error Code. The error code will also be logged to the Event Logging area.

Error and Status Messages

Table 5-2 is an alphabetic list of error and status messages that BIOS generates and an explanation of each message. Many of the messages refer to the built in Setup program. For more information about Setup, refer to the *Configuring Your System* chapter.

Table 5-2. BIOS Messages

MESSAGE	DESCRIPTION
nnnn **Cache SRAM Passed**	Where *nnnn* is the amount of system cache in kilobytes successfully tested.
Diskette drive A error or **Diskette drive B error**	Diskette Drive is present but fails the BIOS POST diskette tests. Check to see that the drive is defined with the proper diskette type in Setup and that the diskette drive is correctly attached.
Entering SETUP ...	The Setup program is starting.
Extended RAM Failed at offset: ***nnnn****	Extended memory is not working or is not properly configured at offset *nnnn*.
nnnn **Extended RAM passed**	Where *nnnn* is the amount of RAM in kilobytes successfully tested.
Failing Bits: ***nnnn****	The hex number *nnnn* is a map of the bits at the RAM address (in System, Extended, or Shadow memory) which failed the memory test. Each 1 (one) in the map indicates a failed bit.
Fixed Disk 0 Failure or **Fixed Disk 1 Failure** or **Fixed Disk Controller Failure***	Fixed disk is not working or not properly configured. Check to see if the fixed disk is attached properly. Run Setup to be sure the fixed disk type is correctly identified.
Incorrect Drive A type - run SETUP or **Incorrect Drive B type - run SETUP**	Type of floppy drive is not correctly identified in Setup.
Invalid NVRAM media type*	Problem with NVRAM (CMOS) access.
Keyboard controller error*	The keyboard controller test failed. You may have to replace the keyboard or controller.
Keyboard error ***nn***	The keyboard is not working. BIOS discovered a stuck key and displays the scan code *nn* for the stuck key.
Keyboard locked - Unlock key switch	Unlock the system to proceed.
Monitor type does not match CMOS - Run SETUP	Monitor type is not correctly identified in Setup.
Operating system not found	The operating system cannot be located on either drive A: or drive C:. Enter Setup and see if the fixed disk and floppy are properly identified.
Parity Check 1 ***nnnn**** or **Parity Check 2** ***nnnn****	A parity error was found in the system bus (Parity Check 1) or the I/O bus (Parity Check 2). BIOS attempts to locate and display the address on the screen. If it cannot locate the address, it displays ????.

* If your system displays this message, write down the message and notify your customer representative. If your system fails after you made changes in the BIOS Setup menus, you may be able to correct the problem by entering Setup and restoring the original values.

Table 5-2. BIOS Messages (Continued)

MESSAGE	DESCRIPTION
Press <F1> to resume, <F2> to Setup	Displayed after any recoverable error message.
Press <F2> to enter SETUP	Optional message displayed during POST. Can be turned off in Setup.
Previous boot incomplete - Default configuration used	Previous POST did not successfully complete. POST loads default values and offers to run Setup. If the failure was caused by incorrect values and they are not corrected, the next boot will likely fail. On systems with control of wait states, improper Setup settings can also terminate POST and cause this error on the next boot. Run Setup and verify that the wait-state configuration is correct. This error is cleared the next time the system is booted.
Real time clock error*	Real time clock fails BIOS test. May require board repair.
Shadow Ram Failed at offset: *nnnn**	Shadow RAM failed at offset *nnnn* of the 64K block at which the error was detected.
***nnnn* Shadow RAM Passed**	Where *nnnn* is the amount of shadow RAM in kilobytes successfully tested.
System battery is dead - Replace and run SETUP	The CMOS clock battery indicator shows the battery is dead. Replace the battery and run Setup to reconfigure the system.
System BIOS shadowed	The system BIOS is copied to shadow RAM.
System cache error - Cache disabled*	The RAM cache failed the BIOS test and BIOS has disabled the cache.
System CMOS checksum bad - run SETUP	The system CMOS has been corrupted or incorrectly modified, perhaps by an application program that changes data stored in CMOS. Run Setup and reconfigure the system either by getting the default values or making your own selections.
System RAM failed at offset: *nnnn**	The system RAM failed at offset *nnnn* of the 64K block at which the error was detected.
***nnnn* System RAM Passed**	Where *nnnn* is the amount of system RAM in kilobytes successfully tested.
System timer error*	The timer test failed. Requires repair of the system board.
UMB upper limit segment address: *nnnn*	Displays the address *nnnn* of the upper limit of the Upper Memory Blocks, indicating released segments of the BIOS which may be reclaimed by a virtual memory manager.
Video BIOS shadowed	The video BIOS is successfully copied to shadow RAM.

* If your system displays this message, write down the message and notify your customer representative. If your system fails after you made changes in the BIOS Setup menus, you may be able to correct the problem by entering Setup and restoring the original values.

Messages and Beep Codes

Whenever a recoverable error occurs during POST, BIOS displays a message on the video display screen and causes the speaker to beep twice as the message appears. BIOS also issues a beep code (one long tone followed by two short tones) during POST if the video configuration fails or if an external ROM module does not checksum to zero.

At the beginning of each POST test routine, the BIOS outputs the test point error code to I/O address 80h. If the BIOS detects a terminal error condition, it halts POST after issuing a terminal error beep code signifying the test point code and attempting to display the test point error code on the upper left corner of the display screen. BIOS derives the beep code from the test point error code as follows:

1. The 8-bit hexadecimal error code is broken down to four 2-bit groups.

2. Each group is made one-based by adding one.

3. Short beeps are generated for the number in each group.

For example, a test point error code of 16 is indicated by a 1-2-2-3 beep code (a single beep, a burst of two beeps, a burst of two beeps, and a burst of three beeps). In addition, BIOS writes a value of 16 on the upper left corner of the display screen and to I/O port 80h to enable debugging tools to identify the area of failure.

Table 5-3 is a list of the test point error codes written at the start of each POST test and the beep codes issued for terminal errors.

Table 5-3. POST Tests

Code	Beeps	POST Routine Description
02	1-1-1-3	Verify Real Mode
04	1-1-2-1	Get CPU type
06	1-1-2-3	Initialize system hardware
08	1-1-3-1	Initialize chipset registers with initial POST values
09	1-1-3-2	Set in POST flag
0A	1-1-3-3	Initialize CPU registers
0C	1-1-4-1	Initialize cache to initial POST values
0E	1-1-4-3	Initialize I/O
10	1-2-1-1	Initialize Power Management
11	1-2-1-2	Load alternate registers with initial POST values
12	1-2-1-3	Restore CPU control word during warm boot
14	1-2-2-1	Initialize keyboard controller
16	1-2-2-3	BIOS ROM checksum
18	1-2-3-1	8254 timer initialization
1A	1-2-3-3	8237 DMA controller initialization
1C	1-2-4-1	Reset Programmable Interrupt Controller
20	1-3-1-1	Test DRAM refresh
22	1-3-1-3	Test 8742 Keyboard Controller
24	1-3-2-1	Set ES segment register to 4 GB
28	1-3-3-1	Autosize DRAM
2A	1-3-3-3	Clear 512K base RAM
2C	1-3-4-1	RAM failure on address line xxxx*
2E	1-3-4-3	RAM failure on data bits xxxx* of low byte on memory bus
30	1-4-1-1	RAM failure on data bits xxxx* of high byte on memory bus
32	1-4-1-3	Test CPU bus-clock frequency
34	1-4-2-1	Test CMOS RAM
37	1-4-2-4	Reinitialize the chipset (MB only)
38	1-4-3-1	Shadow system BIOS ROM
39	1-4-3-2	Reinitialize the cache (MB only)
3A	1-4-3-3	Autosize cache
3C	1-4-4-1	Configure advanced chipset registers
3D	1-4-4-2	Load alternate registers with CMOS values

* If the BIOS detects error 2C, 2E, or 30 (base 512K RAM error), it displays an additional word-bitmap (xxxx) indicating the address line or bits that failed. For example, “2C 0002” means data bits 12 and 5 (bits and 5 set) have failed in the lower 16 bits.

Table 5-3. POST Tests (continued)

Code	Beeps	POST Routine Description
40	2-1-1-1	Set Initial CPU speed
42	1-1-1-3	Initialize interrupt vectors
44	2-1-2-1	Initialize BIOS interrupts
46	2-1-2-3	Check ROM copyright notice
47	2-1-2-4	Initialize manager for PCI Option ROMs
48	2-1-3-1	Check video configuration against CMOS
49	2-1-3-2	Initialize PCI bus and devices
4A	2-1-3-3	Initialize all video adapters in system
4C	2-1-4-1	Shadow video BIOS ROM
4E	2-1-4-3	Display copyright notice
50	2-2-1-1	Display CPU type and speed
52	2-2-1-3	Test keyboard
54	2-2-2-1	Set key click if enabled
56	2-2-2-3	Enable keyboard
58	2-2-3-1	Test for unexpected interrupts
5A	2-2-3-3	Display prompt “Press F2 to enter SETUP”
5C	2-2-4-1	Test RAM between 512 and 640K
60	2-3-1-1	Test extended memory
62	2-3-1-3	Test extended memory address lines
64	2-3-2-1	Jump to User Patch1
66	2-3-2-3	Configure advanced cache registers
68	2-3-3-1	Enable external and CPU caches
6A	2-3-3-3	Display external cache size
6C	2-3-4-1	Display shadow message
6E	2-3-4-3	Display non-disposable segments
70	2-4-1-1	Display error messages
72	2-4-1-3	Check for configuration errors
74	2-4-2-1	Test real-time clock
76	2-4-2-3	Check for keyboard errors
7C	2-4-4-1	Set up hardware interrupt vectors
7E	2-4-4-3	Test coprocessor if present
80	3-1-1-1	Disable onboard I/O ports
82	3-1-1-3	Detect and install external RS232 ports
84	3-1-2-1	Detect and install external parallel ports
86	3-1-2-3	Reinitialize onboard I/O ports

Table 5-3. POST Tests (continued)

Code	Beeps	POST Routine Description
88	3-1-3-1	Initialize BIOS Data Area
8A	3-1-3-3	Initialize Extended BIOS Data Area
8C	3-1-4-1	Initialize floppy controller
90	3-2-1-1	Initialize hard disk drives
91	3-2-1-2	Initialize local-bus hard-disk controller
92	3-2-1-3	Jump to UserPatch2
94	3-2-2-1	Disable A20 address line
96	3-2-2-3	Clear huge ES segment register
98	3-2-3-1	Search for option ROMs. One long, two short beeps on checksum failure
9A	3-2-3-3	Shadow option ROMs
9C	3-2-4-1	Set up Power Management
9E	3-2-4-3	Enable hardware interrupts
A0	3-3-1-1	Set time of day
A2	3-3-1-3	Check key lock
A8	3-3-3-1	Erase F2 prompt
AA	3-3-3-3	Scan for F2 keystroke
AC	3-3-4-1	Enter SETUP
AE	3-3-4-3	Clear in-POST flag
B0	3-4-1-1	Check for errors
B2	3-4-1-3	POST done - prepare to boot operating system
B4	3-4-2-1	One short beep before boot
B6	3-4-2-3	Check password (optional)
B8	3-4-3-1	Clear global descriptor table
BC	3-4-4-1	Clear parity checkers
BE	3-4-4-3	Clear screen (optional)
BF	3-4-4-4	Check virus and backup reminders
C0	4-1-1-1	Try to boot with INT 19
D0	4-2-1-1	Interrupt handler error
D2	4-2-1-3	Unknown interrupt error
D4	4-2-2-1	Pending interrupt error
D6	4-2-2-3	Initialize option ROM error
D8	4-2-3-1	Shutdown error
DA	4-2-3-3	Extended Block Move
DC	4-2-4-1	Shutdown 10 error
DE	4-2-4-3	Keyboard Controller Failure

Table 5-3. POST Tests (continued)

Code	Beeps	POST Routine Description
The following are for boot block in FLASH ROM		
E2	4-3-1-3	Initialize the chipset
E3	4-3-1-4	Initialize refresh counter
E4	4-3-2-1	Check for Forced Flash
E5	4-3-2-2	Check HW status of ROM
E6	4-3-2-3	BIOS ROM is OK
E7	4-3-2-4	Do a complete RAM test
E8	4-3-3-1	Do OEM initialization
E9	4-3-3-2	Initialize interrupt controller
EA	4-3-3-3	Read in the bootstrap code
EB	4-3-3-4	Initialize all vectors
EC	4-3-4-1	Boot the Flash program
ED	4-3-4-2	Initialize the boot device
EE	4-3-4-3	Boot code was read OK

Appendix A

System Cabling

Contents

Before You Begin 1
Static Precautions 1
Standard Configuration 2
RAID Configuration 5

This appendix contains information and procedures on cabling configurations used in your system. The configurations include:

- Standard
- RAID controller.

Before You Begin

Warning: The DC push-button on/off switch on the front panel does not turn off the system AC power. Before doing the procedures in this chapter, make sure that your system is powered off and unplug the AC power cord from the back of the chassis. Failure to disconnect power before opening your system can result in personal injury and equipment damage

Static Precautions

An electrostatic discharge (ESD) can damage disk drives, option boards, and other components. You can provide ESD protection by wearing an antistatic wrist strap attached to chassis ground when handling system components.

Electronic devices can be easily damaged by static electricity. To prevent damage, keep them in their protective packaging when they are not installed in your system.

Standard Configuration

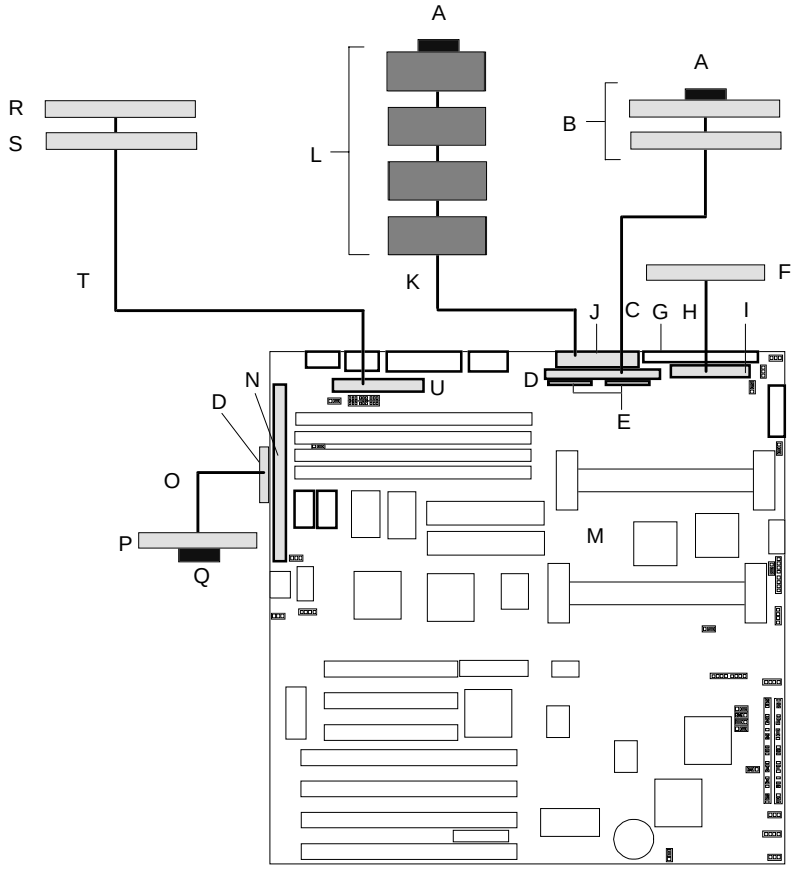
Your system is cabled using the on-board IDE controller and the on-board Adaptec 7880 wide SCSI controller. The on-board IDE controller supports the internally mounted CD-ROM as its first (master) device and an optional internally mounted tape drive as its second (slave) device. The on-board Adaptec 7880 wide SCSI controller is used to control the four hard disk drives. Also, a 3.5-inch diskette drive is installed in all systems and interfaces separately to the system board. Figure A-1 is a diagram of the standard cabling and Figure A-2 illustrates the internal cable routing for this configuration.

The wide SCSI interface cable is connected to the SCSI connector on the top edge of the system board (see Figure A-1, J). This cable connects to the rear of the hard disk drives. The last hard disk drive on the SCSI cable must have it's internal SCSI terminators or terminator jumper installed.

The IDE interface cable is connected to the IDE connector towards the top edge of the system board (see Figure A-1, U). This cable connects to the rear of the internally mounted CD-ROM as its master device (see Figure A-1, R). An optional internally mounted tape drive can be connected to the IDE controller as its slave device (see Figure A-1, S).

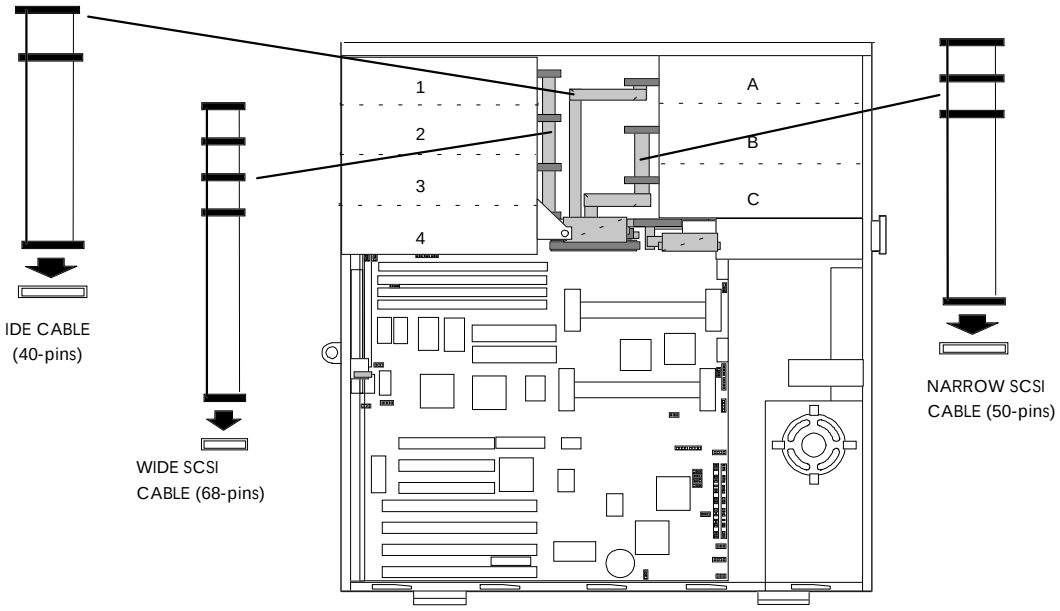
The on-board Adaptec 7860 narrow SCSI controller is used to control up to two optional internally mounted removable media peripherals. The narrow SCSI interface cable is connected to the SCSI connector above the wide SCSI connector on the system board (see Figure A-1, D). This cable connects to the rear of the SCSI removable media peripherals (if present). The last drive on the daisy chain cable must have it's internal SCSI terminators installed. If your server doesn't have any SCSI removable media peripherals, the cable is not used and the narrow SCSI controller is terminated using the SCSI termination resistors (see Figure A-1, E).

Figure A-1. Standard System Cable Configuration



A. Device internal SCSI termination resistors
B. Optional narrow SCSI devices in upper peripheral bays
C. Narrow SCSI interface cable
D. Narrow SCSI connector (50 pin)
E. Internal SCSI termination resistors (not installed when optional internal narrow SCSI devices are used)
F. 3.5-inch diskette drive
G. Front panel connector
H. Diskette interface cable
I. Diskette drive connector
J. Wide SCSI connector (68 pin)
K. Wide SCSI interface cable
L. Wide SCSI Hard disk drives in internal bays
M. System board
N. I/O riser board
O. External narrow SCSI cable
P. External narrow SCSI device
Q. SCSI terminator
R. IDE CD-ROM drive (master device)
S. IDE Tape drive (slave device)
T. IDE interface cable
U. IDE connector

Figure A-2. Standard SCSI Bus Cable Routing



The onboard narrow SCSI controller also includes a connector located at the rear of the system for connecting optional external SCSI devices (Figure A-1,D). Three important rules must be followed if you connect external narrow SCSI devices.

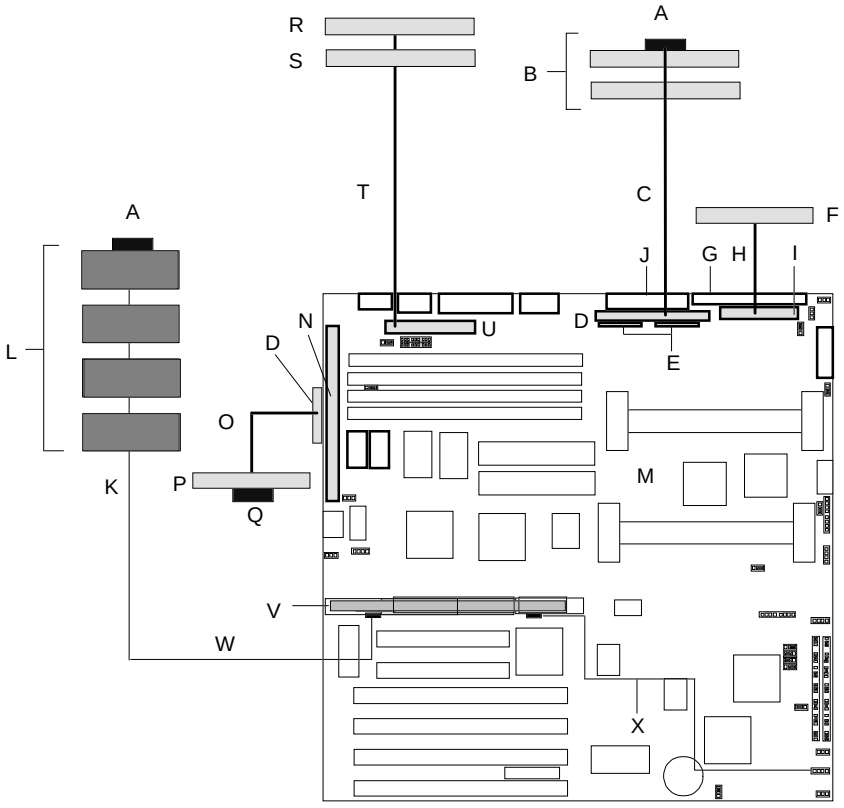
- A maximum of seven narrow SCSI devices may be connected to the onboard SCSI controller. For example if three SCSI devices in the system cabinet are connected to the SCSI bus, only four external narrow SCSI devices can be connected.
- The maximum cable length for all narrow devices connected to the controller is 1 meter (39 inches).
- The last external narrow SCSI device must be terminated. Active termination is recommended.

RAID Configuration

One of the options available for your system is the single channel DAC960 Redundant Array of Inexpensive Devices (RAID) Controller board, which gives your system the added security of fault tolerance. If you order a system with the RAID controller, the system is pre-cabled at the factory (see Figure A-3).

If you are adding the DAC960 controller to an existing system, you must install, cable, and configure the controller. Refer to *The Installing an Option Board* section in the *Upgrades and Options* chapter to install the controller. Once you have installed the controller, remove the wide SCSI interface cable (Figure A-1, J) from the mother board and plug it into the channel 0 connector on the RAID controller. In addition, connect the activity cable (Figure A-3, X) from the RAID controller to J42 on the system board.

Figure A-3. RAID Cable Configuration



A. Device internal SCSI termination resistors
B. Optional narrow SCSI devices in upper peripheral bays
C. Narrow SCSI interface cable
D. Narrow SCSI connector (50 pin)
E. Internal SCSI termination resistors (not installed when optional internal narrow SCSI devices are used)
F. 3.5-inch diskette drive
G. Front panel connector
H. Diskette interface cable
I. Diskette drive connector
J. Wide SCSI connector (68 pin)
K. Wide SCSI interface cable
L. Wide SCSI Hard disk drives in internal bays
M. System board
N. I/O riser board
O. External narrow SCSI cable
P. External narrow SCSI device
Q. SCSI terminator
R. IDE CD-ROM drive (master device)
S. IDE Tape drive (slave device)
T. IDE interface cable
U. IDE connector
V. DAC960 RAID controller in PCI slot J11
W. RAID channel 0 cable connector
X. Activity cable to J42

Appendix B

Memory Configurations

Contents

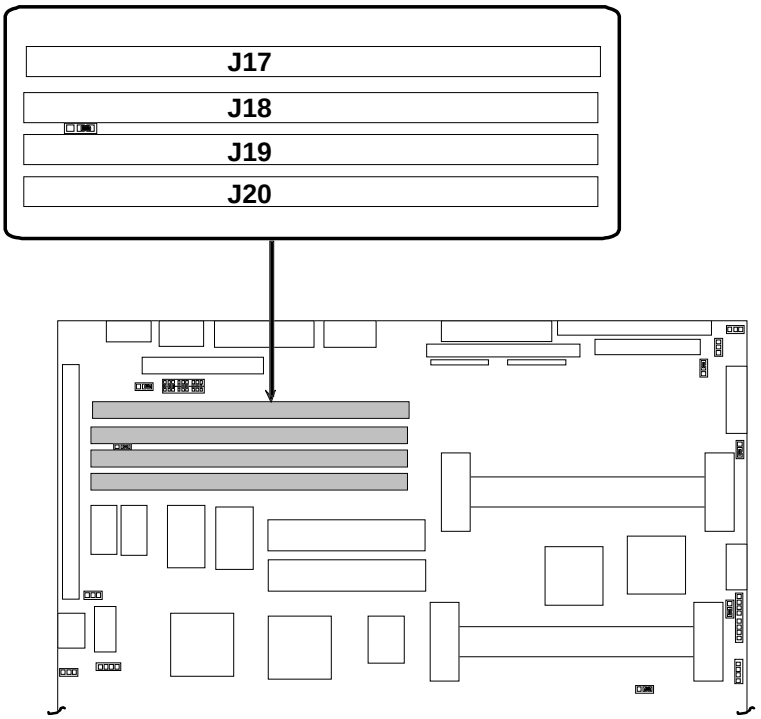
Memory DIMM Configurations..... 1

Memory DIMM Configurations

The system board has four 168-pin DIMM sockets for a total of up to 512MB of system memory, using 128MB DIMMs. See Figure B-1.

The sockets are arranged in a bank that supports a 64-bit wide data path with 8 parity bits. Timing requires 60 ns devices. Parity generation/checking is provided for each byte. Each DIMM socket may have different sizes of memory installed.

Figure B-1. System Board DIMM Sockets



A DIMM socket accommodates a single 168-pin 60 ns device with gold plated edge connectors as follows:

- 4M x 72 DIMM = 32MB
- 8M x 72 DIMM = 64MB
- 16M 72 DIMM = 128MB.

A DIMM should be installed in the bottom (J20) socket. When you install additional DIMMs, you must start with the first empty socket above DIMMs already installed. When you remove DIMMs, you must start with the first DIMM socket closest to the top edge of the system board. Table B-1 lists the distribution of DIMMs for system memory configurations.

Table B-1. Memory Configurations

System Capacity (MB)	Capacity per DIMM slot (MB) Any DIMM slot order			
	J20	J19	J18	J17
32	32			
64	64			
96	64	32		
128	128			
160	128	32		
192	128	64		
224	128	64	32	
256	128	128		
288	128	128	32	
320	128	128	64	
352	128	128	64	32
384	128	128	128	
416	128	128	128	32
448	128	128	128	64
512	128	128	128	128

Glossary

A

AC (Alternating Current) The type of current available in wall outlets. All computers must convert alternating current to direct current to operate. See also DC.

address A label, name, or number that identifies a location in computer memory.

ASCII (American Standard Code for Information Interchange) A standard number assigned to each of the alphanumeric characters and keyboard control code keys to enable the transfer of information between different types of computers and peripherals.

B

backplane slot A connector on the backplane board in desktop computers and expansion boxes that allows you to install circuit cards.

backup A copy of data for safe-keeping. The data is copied from computer memory or disk to a floppy disk, magnetic tape, or other media.

backup battery The battery in your computer that maintains the real-time clock and the configuration information when the computer's power is removed.

base memory An area of memory between 0 and 640 kilobytes.

baud rate The speed with which data is transmitted during serial communication. The computer's operating system and software program must be configured for the same baud rate as the communication device, such as a serial printer. See also bps.

BIOS (Basic Input/Output System) A program stored in flash EPROM or ROM that controls the keyboard, disk drives, video monitor, and other devices. See also flash EPROM, EPROM, and ROM.

bit Derived from BInary digiT, a bit is the smallest unit of information a computer handles. See also byte.

boot The process of loading the operating system into memory.

bps (bits per second) The number of bits transferred in one second during serial communication, such as modem transmission.

byte A group of eight bits.

C

cache memory A very fast, limited portion of RAM set aside for temporary storage of data for direct access by the microprocessor.

CD-ROM drive (Compact Disk ROM drive) A type of mass storage device that reads information from a compact disk.

Centronics port An industry standard parallel port. See also parallel port.

CGA (Color Graphics Adapter) A type of video display system that provides low-resolution text and graphics on TTL monochrome and color monitors.

CMOS (Complimentary Metal-Oxide Semiconductor) A type of low-power integrated circuit used in computers. See also TTL.

COM1 or COM2 The name you can assign a serial port to set or change its address. See also serial port.

command An instruction that directs the computer to perform a particular operation.

configuration The way in which a computer is set up to operate. Some configurable options include CPU speed, serial port designation, and memory allocation.

coprocessor See math coprocessor.

CPU (Central Processing Unit) See microprocessor.

CRT (Cathode-Ray Tube) The type of video display used in monitors for desktop computers.

D

DC (Direct Current) The type of current available in the rechargeable battery packs used in portable computers. See also AC.

default The factory setting your computer uses unless you instruct it otherwise. For example, when powering up, the computer will boot from the default drive.

density The capacity of information (bytes) that can be packed onto a storage device, such as a floppy disk.

device driver A software program that a computer must use to recognize and operate certain hardware, such as a mouse or a video monitor.

disk drive A device that stores data on a hard or floppy disk. A floppy disk drive requires a floppy disk to be inserted; a hard disk drive has a permanently encased hard disk.

DOS (Disk Operating System) See operating system.

DRAM (Dynamic RAM) See RAM.

E

ECC (Error Checking and Correction) A method of detecting and correcting errors.

EEPROM (Electrically Erasable Programmable Read-Only Memory) A type of memory device that stores password and configuration information.

EGA (Enhanced Graphics Adapter) A type of video display system that provides medium-resolution text and graphics on TTL monochrome, color, and enhanced color monitors.

EMS (Expanded Memory Specification) A method of accessing memory beyond the 640K limit of DOS by exchanging data in and out of main memory at high speeds. Some software requires EMS to operate.

EPROM (Erasable Programmable Read-Only Memory) A type of memory device that is usually used to store system BIOS code. This code can be erased with ultraviolet light, but is not lost when the computer is powered off. See also flash EPROM and ROM.

expanded memory See EMS.

expansion slot See backplane slot.

extended memory The protected memory above 1M that is directly accessible by the microprocessor through certain utilities and operating systems. This memory is used in computers with 80286, 80386, and 80486 microprocessors.

F

flash EPROM A type of memory device that is usually used to store system BIOS code. This code can be replaced with updated code from a floppy disk, but is not lost when the computer is powered off. See also EPROM and ROM.

floppy disk drive See disk drive.

format The process used to organize a hard or floppy disk into sectors so it can accept data. Formatting destroys all previous data on the disk.

G

(Gigabyte) 1,073,741,824 bytes. See also byte.

H

hard disk drive See disk drive.

hardware The physical parts of your computer, including the keyboard, monitor, disk drives, cables, and circuit cards.

I

IC (Integrated Circuit) An electronic device that contains miniaturized circuitry.

(ISA Configuration Utility) The program that you use to change the configuration of some ISA desktop computers. This program also contains information about the hardware in the computer.

IDE (Integrated Drive Electronics) A type of hard disk drive with the control circuitry located inside the disk drive rather than on a drive controller card.

interface. A connection between the computer and a peripheral device that enables them to exchange data. See also parallel port and serial port.

ISA (Industry Standard Architecture) An industry standard for computers and circuit cards that transfer 16 bits of data at a time.

J

jumper A small electrical connector used for configuration on some computer hardware.

K

(Kilobyte) 1,024 bytes. See also byte.

L

LAN (Local Area Network) A group of computers linked together within a limited area to exchange information.

LCD (Liquid Crystal Display) The type of video display used in portable computers.

LED (Light-Emitting Diode) A small electronic device that glows when current flows through it.

LPT1 or LPT2 The name you can assign a parallel port to specify its address. See also parallel port.

M

(Megabyte) 1,048,576 bytes. See also byte.

math coprocessor An IC that works with the microprocessor to speed up mathematical calculations.

memory The circuitry in your computer that stores data and programs. See also EMS, extended memory, RAM, and ROM.

microprocessor The integrated circuit that processes data and controls the basic functions of the computer.

modem A device used to exchange information with other computers over telephone or data lines.

module A circuit board that plugs into a dedicated connector on the system board in your computer.

mouse A small input device that you guide on a flat surface to control the cursor movement and operation of the computer when using certain software programs.

N

NVRAM (Nonvolatile RAM) A type of RAM that retains its contents even after the computer is powered off. This memory stores EISA configuration information. See also RAM and SRAM.

O

operating system A set of programs that provides the interface between other software programs and the computer.

P

parallel port The connector on the back of your computer that allows the transfer of data between the computer and a parallel device, such as a parallel printer.

partition The process of dividing the storage space on a hard disk into separate areas so that the operating system treats them as separate disk drives.

password A security feature that prevents an unauthorized user from operating your computer. See also EEPROM.

PCI Peripheral Component Interconnect. PCI is a high-performance peripherals I/O bus supporting data transfers of up to 132MB per second.

Pentium A type of microprocessor, with a built-in math coprocessor, cache memory, and memory and bus controllers, that processes and communicates 32 bits of data at a time. This microprocessor also contains power management capabilities.

peripheral A device connected to and controlled by the computer, such as an external disk drive or a printer.

pixel The smallest element that is visible on a video display. The resolution of a video display system is measured in pixels.

POST Power-On-Self-Test.

R

RAM (Random-Access Memory) A temporary storage area for data and programs. This type of memory must be periodically refreshed to maintain valid data, and is lost when the computer is powered off. See also NVRAM and SRAM.

RCU (Resource Configuration Utility) The program that you use to change the configuration of your system. This program also contains information about the hardware in your system.

real-time clock The IC in your computer that maintains the time and date.

ROM (Read-Only Memory) A type of memory device that usually is used to store system BIOS code. This code cannot be altered and is not lost when the computer is powered off. See also BIOS, EPROM, and flash EPROM.

RS-232C port An industry standard serial port. See also serial port.

S

save To store information on a floppy disk, hard disk, magnetic tape, or some other permanent storage device.

SCSI (Small Computer System Interface) An industry standard interface that provides high-speed access to tape drives, hard disk drives, and other peripheral devices.

serial communication Information sent sequentially, one bit at a time.

serial port The connector on the back of your computer that allows the transfer of data between the computer and a serial device, such as a mouse, a modem, or a serial printer.

Setup program The program that you use to change the configuration of some ISA desktop and notebook computers. This program also contains information about the hardware in the computer.

software Programs with specific functions, such as word processing, data base management, communications, and operating system.

SRAM (Static RAM) A temporary storage area for data and programs. This type of memory does not need to be refreshed, but it is lost when the computer is powered off. See also NVRAM and RAM.

SVGA (Super VGA) A type of video display system that provides very high-resolution text and graphics on analog color monitors.

system board The main circuit board in your computer. It contains most of the connectors and ports.

T

tape drive A type of storage device using magnetic tape.

TTL (Transistor-Transistor Logic) A type of integrated circuit used in computers. See also CMOS.

V

VGA (Video Graphics Array) A type of video display system that provides high-resolution text and graphics on analog color monitors.

Equipment Log

Use this equipment log form to record pertinent information about your system. You will need some of this information to run the System Configuration Utility. Be sure to update the equipment log when you add options.

Record the model and serial numbers of the system components, dates of component removal or replacement, and the name of the vendor from whom the component was purchased. Be sure to record the same information for any components added to the system, such as hard disk drives, add-in boards, or printers.

Record the model and serial numbers of the unit and system baseboard. The model and serial numbers of the system unit are recorded on a label attached to the rear of the unit. The serial number of the baseboard is located along the left side of the board, near the PCI expansion slot covers.

The location of serial numbers on add-in boards, hard disk drives, and external equipment, such as video displays or printers, varies from one manufacturer to another. Literature accompanying these products should illustrate or describe the location of model and serial numbers.

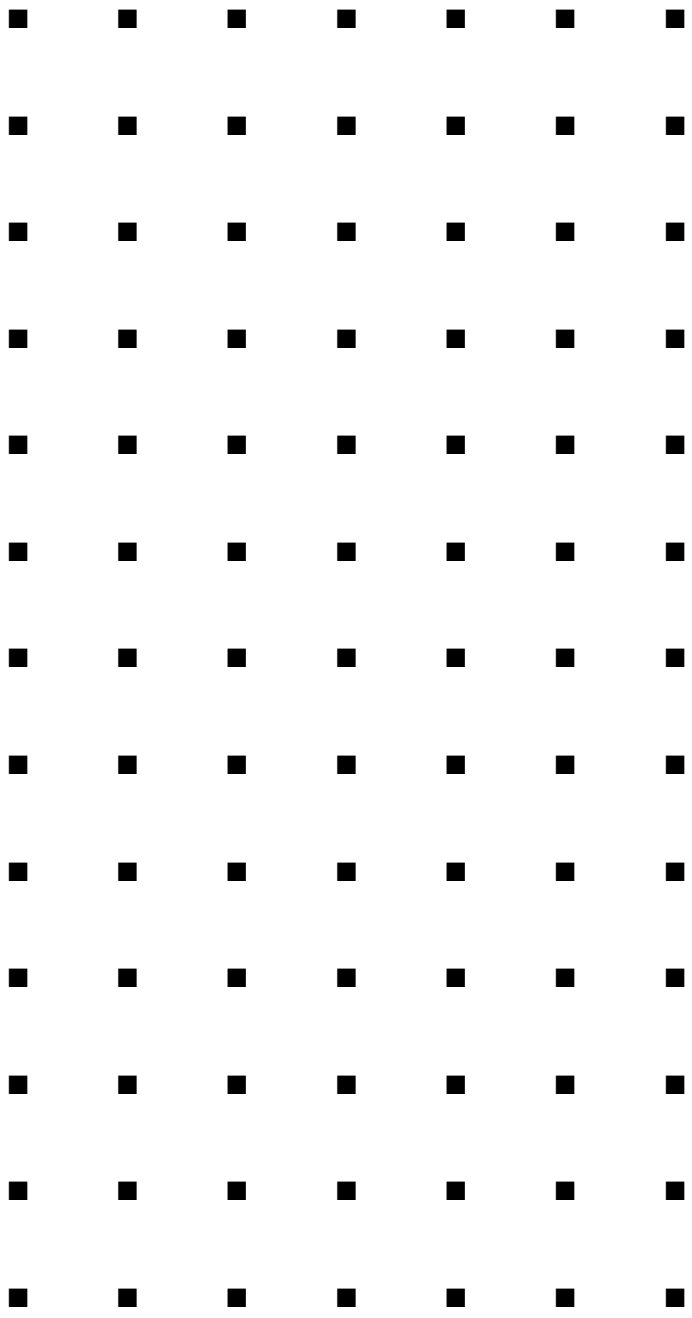
Equipment Log

Component	Manufacturer Name and Model	Serial Number (if available)	Date Installed
Server			
Baseboard			
2nd CPU			
DIMMs			
Video Mem. DRAM			
Srvr. Monitor Mod.			
Diskette Drive A			
Diskette Drive B			
Tape Drive 1			
Tape Drive 2			
Tape Drive 3			
CD-ROM Drive			
Hard Disk Drive 1			
Hard Disk Drive 2			
Hard Disk Drive 3			
Hard Disk Drive 4			
Optional SCSI Controller			
Optional RAID Controller			
DigiBoard 1			
DigiBoard 2			
Network Controller 1			
Network Controller 2			
Monitor			
Keyboard			

(continued)

Equipment Log (continued)

Component	Manufacturer Name and Model	Serial Number (if available)	Date Installed
Mouse			
External SCSI Peripherals			



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